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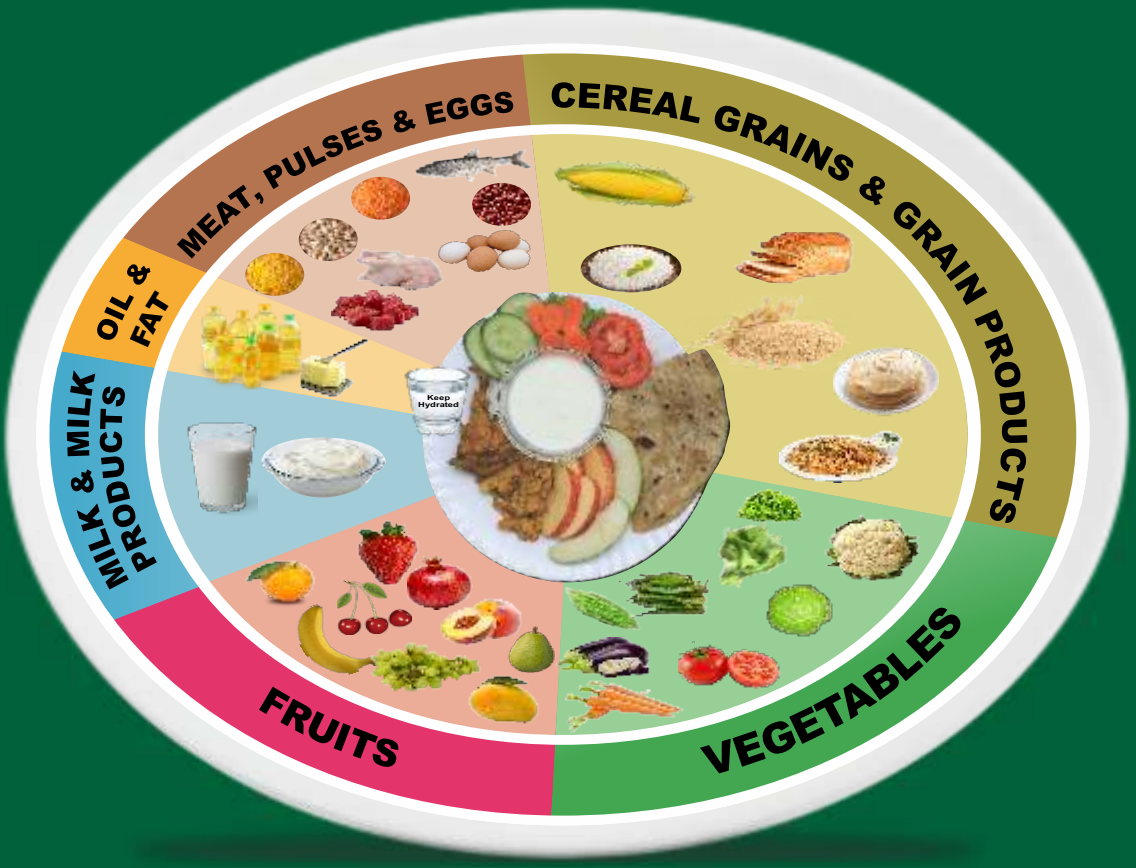
Nutrition Section

PAKISTAN DIETARY GUIDELINES FOR BETTER NUTRITION



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Dietary Guidelines
for Better Nutrition

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FOREWORD

The Pakistan Dietary Guidelines for Better Nutrition (PDGN) are comprehensive country specific guidelines for the general public to adopt healthy eating practices, prevent and reduce the risk of infectious and chronic diseases. The guidelines are simple to adopt, provide age and gender appropriate and culturally acceptable options to choose nutritious foods.

The PDGN provide a thorough review of the food security, health and nutrition situation of the population and is cognizant of the fact that about half of the population is deficient in one or more essential nutrients, reflecting unhealthy dietary practices compounded by poor hygiene and sanitation. Women and young children are more vulnerable to nutritional deficiencies, morbidity and mortality due to their compromised health and nutritional status. The PDGN highlight the predominant consumption of energy dense foods and monotonous diets by the majority of the population.

The emphasis of the PDGN is specified on the consumption of more variety of safe and nutritious foods including milk and milk products, meat and pulses, wholegrain cereals, vegetables and fruits and decreasing consumption of energy dense foods such as deep fried foods, bakery products, processed foods and reducing the amount of fat specifically saturated fat, oil, sugar and salt in cooking, as there is a strong relationship between diet and disease, essentially non-communicable diseases such as diabetes, cardiovascular diseases and others that are associated with poor dietary habits. Food and diet in association with nutrition and health, is one of the most important aspect for healthy life. Physical activity is also critical for all population groups to remain physically fit and healthy.

PDGN are rich resource for the general public, decision makers, policy planners, researchers, academicians, food and pharmaceutical industries, hospitals, agriculture extension and allied health professionals; and a potential source for integration into their own plan of actions and interventions. These guidelines will benefit the communities, clients and consumers in making healthy food choices and well suited to break the vicious cycle of malnutrition when integrated into nutrition sensitive and the social development programs of the country.

I appreciate the efforts of the contributors; with a successful dissemination and use of guidelines that would serve as an effective tool for the improving nutrition and wellbeing of the population of Pakistan.

Sartaj Aziz
Deputy Chairman
Planning Commission of Pakistan

28 May, 2018

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The Ministry of Planning, Development and Reform is highly indebted to distinguished and renowned academicians, researchers, programme managers, policy makers, development partners and other stakeholders for their valuable inputs in formulation of PDGN, which will serve as a source of guidance for planning and implementation of nutrition related programmes aimed at promoting healthy diets and preventing malnutrition and diseases.

M. Aslam Shaheen
Chief Nutrition/SUN Focal Person
Ministry of Planning, Development & Reform Pakistan

MESSAGE FROM THE FAO REPRESENTATIVE

Pakistan Dietary Guidelines for Better Nutrition (PDGN) are developed for the general public to support healthy eating, improve overall health and reduce malnutrition in all its form, including preventing disease and premature deaths. It is an opportune time to disseminate the dietary guidelines, when the country is confronted with challenges of diet associated diseases including overweight, obesity, diabetes, hypertension, cardiovascular diseases and cancers.

PDGN are intended for use by public health and nutrition service providers, food and agriculture professionals, program managers and policy makers to frame cost- effective, high impact policies and interventions that would help the public in making better food choices that are safe, nutrient rich and healthy.

PDGN provide an affordable and sustainable means of improving nutrition and health wellbeing of the population, which is a pre-requisite for socio-economic development, peace, prosperity and security in the country. The cost of malnutrition and associated diseases outweigh the nominal cost of food therefore, food and nutritional wellbeing should be prioritized in household expenditures.

Dissemination and use of dietary guidelines are essential to create and promote nutrition awareness among the population. Strong public-private partnerships and community involvement are critical for successful adoption of these dietary guidelines. I appreciate the efforts and contributions of the technical experts for the timely production of PDGN, benefitting all segments of the society including poor, rich, urban and rural for the adoption of healthy eating practices to enhance the quality of life.

Minà Dowlatchahi
FAO Representative
Pakistan

ACRONYMS

AMDR	acceptable macronutrient distribution range
BMI	body mass index
BMR	basal metabolic rate
CAD	coronary artery disease
CVDs	cardiovascular diseases
DALYs	disability adjusted life years
DNA	deoxyribonucleic acid
FAO	Food and Agriculture Organization of the United Nations
DGs	Dietary Guidelines
FCPs	food consumption patterns
GDP	gross domestic product
HDL	high-density lipoproteins
IYCF	infant and young child feeding
Kcals	kilocalories
LDL	low-density lipoproteins
MDER	minimum dietary energy requirement
MPDR	Ministry of Planning, Development and Reform
NCDs	non-communicable diseases
NNS	National Nutrition Survey
NoU	number of undernourished
NRVs	nutrient reference values
PBS	Pakistan Bureau of Statistics
PDGN	Pakistan Dietary Guidelines for Better Nutrition
PoU	Prevalence of Undernourishment
RDAs	recommended dietary allowances
SoFI	State of Food Insecurity
WASH	water, sanitation, and hygiene
WHO	World Health Organization

EXECUTIVE SUMMARY

Pakistan Dietary Guidelines for Better Nutrition (PDGN) are dietary recommendations based on scientific knowledge related to nutritional requirements, food consumption patterns and nutrients intake of the population. The PDGN are developed taking into account the country's food and nutrition situation and the role of diet in health and disease. Pakistan has been passing through a demographic, economic and nutrition transition characterized by rising population, food accessibility issues, unhealthy eating trends, lack of safe food handling and management practices, and sedentary lifestyles. This has led to nutritional deficiencies in children, adolescents and adults, especially women, and an increase in nutritional disorders and diet related diseases (diabetes, hypertension, cardiovascular diseases, cancers and infectious diseases etc.).

First country specific Dietary Guidelines (DGs) were developed in 2005. The latest scientific evidence has highlighted the beneficial effects of food and bioactive factors on one side, and the harmful effects of adulterants, contaminants, pesticides and insecticides and unhealthy food consumption patterns on the other side. Excess use of salt, sugars, and saturated and trans-fatty acids has been recognized as negatively affecting the health of the population. These developments have been well thought-out during the revision of PDGN. Consultative workshops were held, with active participation of technical experts and relevant stakeholders to develop and finalize the framework of PDGN. An extensive literature search and desk review were undertaken to review the food consumption patterns, nutrients intake, nutritional and health status of the population. National and international recommended dietary allowances (RDAs) and dietary guidelines were reviewed to extract relevant information for the development of PDGN.

Diet is one of the strongest determinants of health and nutritional status. Inappropriate and unhealthy dietary practices are responsible for the increased prevalence of nutritional deficiencies and disorders, infectious diseases, overweight and obesity, non-communicable diseases (diabetes, hypertension, cardiovascular diseases, cancers and other chronic diseases etc.). Sedentary lifestyles in the population exacerbate the prevalence of nutrition and health problems in one or the other way. Conversely, dietary modifications to select and consume healthy diet have been proven to reduce diet related chronic diseases in the population.

The PDGN put great emphasis on exclusive breastfeeding for infants for the first six months of life followed by continuation of breastfeeding till the age of two years along with age appropriate complementary feeding starting at six months.

The PDGN recommend the daily consumption of basic food groups including cereal grains and grain products, meat, pulses and eggs, milk and milk products, vegetables and fruits. The guidelines suggest that the consumption of refined cereals should be reduced and substituted by wholegrain cereals while the consumption of fresh fruits, vegetables, pulses, meat and milk be increased as per body requirements. It is further recommended that the use of salt, sugar, saturated fats, trans-fatty acids, cooking oil, sweets, soft drinks, artificial juices, fruit/flavoured drinks and beverages, refined and processed foods should be limited.

Safe food handling and management practices need to be enhanced while controlling use of contaminated/ untreated industrial wastewater. The insecticides, pesticides, antibiotics and the concentrations of heavy

metals like lead, arsenic, mercury and cadmium in foods must be checked as per standards and within the permissible ranges as recommended by the Codex Alimentarius Commission, food safety authorities and Pakistan Standard Quality Control Authority.

In addition to diet, regular exercise and physical activity are crucial for the prevention and management of diseases through the guidelines. The essence of PDGN is to provide up dated dietary recommendations to the general population for promoting good nutrition, safe food handling/ management practices and adoption of healthy lifestyle for quality life and economic productivity.

The PDGN will be useful for professionals and policy makers to formulate appropriate policy, plan and programmes directly or indirectly. The guidelines will also facilitate provincial food and drug authorities to implement food quality standards in their respective provinces for ensuring that foods; and food and nutrition products are safe and of better quality. The PDGN are intended to help in maintaining healthy body weight and reduce the incidence of under-nutrition, overweight, obesity, premature deaths, and infectious and non-communicable chronic diseases by promoting healthy diets.

INTRODUCTION

Optimal nutrition is essential for the physical and cognitive development of the body, behavioural and scholastic performance, better health and productivity, improved quality of life and socio-economic development of the country. Pakistan is challenged by problems of household food insecurity, poverty and all forms of malnutrition. The growing epidemic of non-communicable chronic and infectious diseases, has put an enormous burden on health services, resulting in avoidable disabilities and premature deaths. Food systems and dietary patterns are key determinants of nutrition and health. Promoting good nutrition, healthy diets and sustainable food systems in the context of population growth, dietary transition and changing climate requires coordinated efforts of all actors and stakeholders[1].

A growing body of evidence suggests that unhealthy dietary and lifestyle practices are the key risk factors to the growing disease burden[2-5]. Malnutrition accounts for half of the children's deaths that costs about 3% of yearly GDP in developing countries and results in losses of more than 10% of lifetime earning potentials in malnourished children[6-7]. Likewise, increased and frequent consumption of energy dense, nutrient poor foods with high salt, sugar and fats lead to overweight and obesity, which consequently increase the prevalence of metabolic syndromes, chronic diseases and premature deaths. It has been estimated that 340,000 cancer cases per year in the United States would be prevented with a healthy diet, combined with physical activity and maintaining a healthy weight[8].

Nutrition transition and lifestyle changes have led to an increased prevalence of overweight and obesity and a pandemic of non-communicable diseases (NCDs) i.e., diabetes, cardiovascular diseases, hypertension and cancers. NCDs are the leading cause of premature deaths in both developed and developing countries and accounted for 38 million of the world's 56 million deaths in 2012[9]. Expenditure on the treatment of NCDs amounts to billions of dollars annually adversely affecting the economy of countries, increasing disabilities, high premature deaths and impaired physical productivity and economic outputs. NCDs are responsible for the loss of productive life years and cause innumerable sufferings for families and societies.

In Pakistan, an estimated prevalence of diabetes was 26.3%, with a higher prevalence of diabetes in urban areas 28.3% as compared to rural areas 25.3%[10]. In addition, cardiovascular diseases are one of the leading causes of disability and premature deaths in adults worldwide. Low to middle income countries bearing the maximum brunt, by accounting for over 80% of the global disease burden and overwhelming health expenditures amounting to billions of dollars annually[11-12]. Similarly, CVDs account for 19% of all the deaths occurring in adults aged 30-70 years in the country[13].

A significant synergistic relationship exists between nutrition and disease; therefore good nutrition is essential for the prevention, control and treatment of diet related diseases. Appropriate dietary practices and lifestyle modifications are direly required to prevent the increasing prevalence of malnutrition related effects. The PDGN are comprehensive dietary recommendations for maintaining optimum health and nutrition of the population including all age and gender groups, and is based on available knowledge on food consumption, dietary patterns, nutritional requirements, lifestyle and the relationship between diet and diseases.

The PDGN provide a framework to guide the general population in the selection and consumption of a variety of safe and nutritious foods that are easily available and affordable, meet the daily nutritional requirements, and promote a healthy diet. Development of dietary guidelines require review of population specific food consumption patterns, dietary habits, nutrients intake, nutrition and health status, socio-economic conditions and understanding of diet related public health issues of the population. In PDGN, the emphasis has been given on the consumption of a variety of safe and nutritious foods rather than nutrients, as the former is primarily consumed and easy to recall for dietary assessment and nutrient intakes.

Rationale

- First national DGs were developed in 2005 by the Ministry of Health, Government of Pakistan to provide dietary recommendations for infants, children and adults. Lack of dietary diversification, unsatisfactory maternal and child care practices, industrialization and changing lifestyles in addition to natural catastrophes have led to a deteriorating nutrition situation in the country. This situation has made it essential to review the relationship between diet and disease in the local context and revisit the existing food based dietary guidelines to mitigate the risk factors for under-nutrition, overweight, obesity and chronic diseases.

- The PDGN has taken into account the local dietary practices, eating habits, cooking methods; and nutrition and health situation of the population. The cost of diet, socio-cultural practices, economic and environmental conditions that influence the nutritional requirements of individuals by and large are also considered.

- As food consumption and dietary patterns of individuals vary from country to country, so do the dietary guidelines developed to meet the nutritional requirements of the population on the basis of age, gender and physiological status. Similarly, with the passage of time, there has been an increase in population growth, rural to urban migration as well as changes in dietary habits, socio-economic conditions, lifestyles and prevalence of communicable and non-communicable diseases. Hence, dietary guidelines need to be revised to meet the changing population needs.

- The PDGN provide a list of foods with number of servings to help the general public in making smart and healthy food choices for a healthy, long and active life. Women of childbearing age, preschool children and adolescents are more vulnerable to nutritional deficiencies due to their increased physiological requirements and prevailing dietary and socio-cultural practices. therefore, the development and implementation of age specific dietary guidelines are vital for maintaining nutritional balance, weight management, prevention of diseases and improving quality of life of the population particularly the most vulnerable groups including women of childbearing age, preschool children and adolescents.

- The PDGN is a resource for evidence-based decision-making and better policy choices. The guidelines also serve as a tool for programme managers and professionals engaged in agriculture, food, nutrition and health sectors to develop cost-effective policies, strategies and nutrition programmes that promote a healthy diet, support production, access and utilization of safe and nutritious foods.

Goals

The goals for PDGN are to:

- Improve nutritional wellbeing of the population by adopting and promoting healthy eating practices and lifestyles
- Reduce the incidence of nutritional deficiencies and chronic diseases in the population
- Improve the quality of life of the population, and contribute to the socio-economic development of the country

Objectives

The objectives for PDGN are to:

- Promote healthy dietary practices among the individuals and population to maintain health and reduce or control nutritional deficiencies and diseases.
- Use PDGN for formulating relevant policies, strategies and plans.
- Integrate physical activity into dietary interventions to achieve an effective and sustainable weight management programme.
- Promote hygiene, safe food handling, proper preparation and improved storage practices to reduce and control food and water-borne diseases.

NUTRITION SITUATION

Nutritional status of infants (0-6 months)

Early infancy (0-6 months) is a period of rapid body growth and brain development characterized by increased nutritional requirements that can only be ensued through exclusive breastfeeding. Exclusive breastfeeding is essential for optimum growth and development of infants during the first six months and lays the foundation for future nutrition and health status of individuals. Mother's milk during the first six months is considered nutritionally complete and sufficient to meet the infant's nutrient and fluid requirements. Exclusive breastfeeding should be initiated within the first hour of birth and continued till six months of age without introducing any other food to the infant. Breast milk is rich in immunoglobulins and other anti-infective factors such as lysozymes, lactoferrin, interferon, anti-inflammatory and immune-modulating components that enhance immunity and reduce infant morbidity and mortality[14]. It has been reported that breastfed infants have at least six times greater chances of survival than non-breastfed infants[15].

It has been reported that in Pakistan, only 24% of the women initiate early breastfeeding while exclusive breastfeeding under six months is estimated at 37% which falls under the category of low exclusive breastfeeding countries[16-17]. The late initiation of breastfeeding and low prevalence of exclusively breastfeeding make infants more vulnerable to nutritional deficiencies and diseases. Promoting exclusive breastfeeding has great potential to improve the nutritional and health status of young children. Mothers and caregivers need to be encouraged to initiate breastfeeding within one hour of birth, exclusively breastfeed their babies for six months and continue breastfeeding along with appropriate complementary foods up to two years[18]. The appropriate duration of breastfeeding has been linked to reduced risk of childhood illnesses, obesity and improved cognitive outcomes.

Nutritional status of infants and young children (6-24 months)

Adequate infant and young child feeding is vital for growth and is fundamental to the development of each child's full human potential and for preventing chronic malnutrition, which is manifested by high prevalence of stunting in Pakistan. It is well recognized that the period between pregnancy and childhood up to two years of age (the first 1000 days of life) is a critical window for the promotion of optimal growth, health and behavioural development. It provides a window of opportunity to intervene, prevent growth faltering, malnutrition and diseases in children while providing a strong foundation for future physical and mental performance leading to improved quality of life. Nutrient requirements of infants after six months of age increase which cannot be met with breast milk alone, therefore, it must be complemented with good quality and quantity of safe and nutritious complementary foods. Breast feeding along with complementary

feeding must be continued till two years of age and the amount of complementary foods should be increased gradually ensuring safe food in variety and nutritious quality, best suited to the needs of the growing infant.

In Pakistan, poor infant and young child feeding (IYCF) practices are the leading cause of child morbidity and mortality. Poor IYCF in the form of delayed initiation of breastfeeding, infrequent and or inadequate breastfeeding, avoidance of giving colostrum, frequent use of prelacteals, use of breast milk substitutes, too early or too late introduction of quality complementary foods, inadequate postnatal care and poor hygienic practices; increase children vulnerability to nutritional deficiencies, infectious diseases and deaths. It has been reported that only 39% of infants receive complementary foods at the recommended time between 6-8 months[16].

Improved IYCF practices have great potential to reduce malnutrition, diseases and deaths in children. At least 20% of child deaths could be prevented through improved infant and young child feeding practices, which are safe, non-invasive and cost effective as well[14]. Comprehensive, multi-sectoral integrated efforts are needed to protect, promote and support exclusive breastfeeding and complementary feeding practices essential for child survival. There is increasing recognition that optimal complementary feeding depends not only on what is fed, but also on how, when, where, and by whom the child is fed. It is essential to ensure that caregivers are provided with appropriate guidance regarding optimal feeding of infants and young children.

Nutritional status of children (2-3 years)

Growth and development of children in this age group become slower than in the first two years of life along with improved digestive and enzymatic capacity, enhanced neural and hormonal responses, which make children less vulnerable to nutritional deficiencies and diseases. Further, children in this age group are able to digest, absorb and utilize family foods and beverages and love to taste and eat family foods with minimum efforts of the parents. Children in this age group on average gain about 2-2.5kg weight and grow 8-9 cm in height per annum[19].

The slower growth and development of children elicits lower nutrients demand from exogenous sources and should be considered a period of “catch-up growth” to replenish the body's nutrient stores and cover the earlier growth deficits. However, due to lack of awareness and education of mothers/ caregivers, poor dietary practices, poor hygiene and sanitation, children are unable to cover their growth deficits and are increasingly susceptible to nutritional deficiencies and diseases. Rates of stunting, wasting and underweight continue to rise in all the developing countries including Pakistan associated with a higher prevalence of diarrhoea and acute respiratory infections, which are the leading causes of morbidity and mortality in children[20-22].

Nutritional status of children (3-10 years)

Growth and development during 3-10 years of age become relatively slower than the early childhood period but an adequate and well-balanced diet is still required not only to cover the earlier age growth deficits but also meet the growth and development of the growing child. Children are relatively less vulnerable to nutritional deficiencies than infants and young children due to their improved digestive, physiological, metabolic, neurological and muscular coordination, slow growth and development and reduced nutritional requirements. Nature provides a better opportunity for children for catching-up on their earlier growth deficits, replenishing their body stores and making them ready for the adolescence growth spurt. During this period, children on average gain 2 kg weight and grow 5-6 cm in height per annum[19]. Pakistani children though show improvement in their weight and height with increasing age but fail to recover significantly due to early age nutritional deficits and hence their weight and height remain lower than the corresponding age reference children[20]. Similar results on anthropometric measurements of children have also been reported in several studies[23-24].

Inadequate consumption of milk and milk products along with inadequate consumption of fortified foods in children's diet and inadequate exposure to sunlight makes them prone to calcium, phosphorous and vitamin D deficiencies. These deficiencies are responsible for poor bone mass and are an increasing risk factor for rickets in children. Snacks consumption of children is limited to eating nutritionally poor and energy dense foods such as candies, sweets, toffees, soft drinks, samosas, crackers, pakoras and rolls etc. that are unable to meet most of the macro and micronutrients requirements of the body[25]. Similarly, a large proportion of children do not regularly consume meat and meat products, fruits and vegetables either due to their unavailability at the household level or personal disliking and insufficient knowledge. Data on children's dietary practices highlight that children's diets are lacking in nutrients dense foods, which increase the risk of nutritional deficiencies, malnutrition and various diseases[26].

Nutritional status of adolescents (10-19 years)

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Adolescence is a period of transition between childhood and adulthood covering the age between 10-19 years[27]. It is marked by a rapid increase in the reproductive, skeletal and physical growth and development of adolescents. The rapid physical and physiological growth provides the foundation for accomplishing present and future responsibilities more efficiently that can only be ensured with adequate and optimal nutrition. Conversely, lack of a balanced, nutritionally optimal diet at this critical juncture puts individuals and their future generations at a greater risk of nutritional deficiencies and makes them more vulnerable to diseases[28].

Adolescence exerts greater nutritional demands to meet increasing body needs for nutrients and is greatly influenced by poor food choices and unhealthy eating habits. Eating disorders are more common during this crucial transitional stage of growth and can be attributed to a variety of factors such as peer pressure, body image consciousness, lack of self-esteem and other social influences. Adolescents with severe eating disorders suffer from impaired physical and psychological growth and development.

Review of data on Pakistani adolescents' nutritional status revealed that about one-third of the adolescents are either stunted or underweight and around 10-30% are overweight and obese. However, the prevalence of under-nutrition and overweight in adolescents varies from region to region due to differences in dietary patterns, socio-economic conditions and other environmental factors[29,114].

Dietary practices of adolescents show that skipping breakfast is more prevalent in girls than boys and there is no significant difference in the frequencies of skipping breakfast between the different socio-economic groups[25]. Tea with bread and curry are the more commonly consumed breakfast foods of adolescents of the lower socio-economic group while milk, juice, fruit, cereals, paratha and eggs are more often consumed breakfast items in higher income group. Candies, samosas, pakoras, rolls, potato chips, processed chickpeas and beans are largely consumed as snacks by adolescents of lower socio-economic groups while ice creams, fruit chats, burgers, french-fries and soft drinks are mostly consumed as snacks by the higher income groups[25].

The frequency of dairy, fruits and meat consumption indicates that at least two-thirds of the adolescents do not eat the recommended amounts and are therefore, more likely to be deficient in meeting the recommended daily dietary intakes of iron, zinc, calcium, phosphorus, and many other nutrients.

Nutritional status of adults (19-60 years)

Adults in Pakistan are also confronted with the problems of underweight, overweight and obesity with an alarmingly high prevalence of non-communicable diseases. About a quarter or more of adults are deficient in one or more nutrients like iron, vitamin A, calcium, vitamin D, zinc and iodine and are suffering from diabetes, hypertension, cardiovascular diseases and cancer[2]. Women in Pakistan are more vulnerable to nutritional deficiencies and non-communicable diseases than men with 18% underweight, 19% overweight, 10% obese, 50% anaemic, 42% vitamin A and zinc deficient due to poor dietary practices, lower access to health care services and heavier workloads with multiple domestic and outside jobs[2]. It has been reported that women with a mean age of 52 years had a higher prevalence of coronary artery disease i.e., 30% compared to 23.7% in men in the same age group[31].

According to the National Diabetes Survey (2016-17), 26.3% of the adult population was suffering from diabetes. Urban women had a higher prevalence of diabetes than rural women above the age of 40 years. While in men this trend was seen in the age group of 60 years and above[10]. Statistics on demographic, economic, social, nutrition and health indicators of Pakistan revealed that though there is an improvement in per capita income[33] and household possession of electric goods, transportation and communication facilities, yet no substantial improvement has been observed in the nutrition and health indicators of the country. For better health outcomes and improved quality of life, concrete measures are needed to address the nutrition and public health issues.

Nutritional status of elderly (>60 years)

In Pakistan, the older population constitutes 4% of the total population and the proportion is likely to increase over the period of time[34]. The advancement of medical technologies, diagnostic facilities and a surge in per capita income has led to an increase in the life expectancy and the proportion of older population. The elderly because of their waning health and compromised physiological functions i.e., decreased mastication, salivation, gastric secretion, digestive and absorptive capacity combined with decreased physical activity and appetite, loss of lean body mass and skeletal muscle, need nutritious diet and quality health care to reduce the risk of physical and mental disabilities and ultimately to control diseases.

Providing the adequate health and social needs of older people is becoming a challenge both for the poor families and the government due to less sensitization of the issue, limited commitment and insufficient resource mobilization by the government to meet dietary, health, social and other related services particularly to the poor families in meeting their nutritional requirements.

It has been estimated that in Pakistan, over 72% of the older people have five or more health problems but there has been hardly any nutrition and health care programme to address their nutrition and health needs[34]. Diabetes, hypertension, coronary artery disease, arthritis and cancer are on the rise, causing an increase in the family sufferings due to high medical costs, increased care, leading to overburdening the health care system with loss of billions of rupees and increased early deaths of elderly. Financially stable older people get relatively better nutrition and health care services in comparison to those belonging to

poor families who are under tremendous pressure, stress and unable to get proper nutrition and health care. In Pakistan, limited or negligible work has been done on the older population to assess their nutrients requirements and intake, however, small cross-sectional studies revealed that diet of elderly is deficient in almost all the macro and micronutrients[35-36].

The existing food consumption data on older population revealed that their diet is mainly energy dense and less diversified, which makes them vulnerable to nutritional deficiencies with impaired immune functions and increased risk to acute and chronic diseases. Comprehensive, holistic, cost-effective dietary and health care interventions including nutritional assessment, counselling, dietary supplementation, and establishment of nursing homes for older people with improved health and social care are obligatory to enable them to participate in the socio-economic development of the country, reduce their sufferings and improve their quality of lives.

Nutritional status of pregnant women

Pregnant women are more vulnerable to nutritional deficiencies and health problems due to increased nutritional requirements to meet their physiological needs, sustain foetal growth and development. Decreased nutrient intake during pregnancy has been attributed to cultural, social and economic reasons. In Pakistan, early marriages coupled with poor dietary intakes and lack of proper antenatal health care further compromises the nutritional status of pregnant women with an increased prevalence of nutritional deficiencies.

According to NNS 2011, 62% of the pregnant women sought antenatal care (ANC) being greater in urban (81.4%) than rural settings (53.7%)[2]. The low utilization of ANC in rural areas could be due to lack of awareness, unavailability or long distance from home to ANC facilities and socio-cultural reasons that may restrict women mobility. Similarly, it has been reported that a quarter of women received vitamin-iron supplements during pregnancy. The low consumption of supplements by women was attributed to lack of knowledge about the need and importance of supplements and food source of vitamin-minerals[2].

Poor dietary practices among pregnant women were reflected by the increased prevalence of malnutrition i.e., about 50% of the women were either underweight, overweight or obese, 16% had night blindness, 51% were anaemic, 37% iron deficient, 46% vitamin A deficient, 48% zinc deficient, 69% vitamin D deficient and 59% were calcium deficient[2]. These results were substantiated by others[37] who reported that only 57.3% and 46% of pregnant women increased their food frequency and food intake respectively, 61% took dietary supplements, whereas 17.3% made no changes in their dietary intakes. A good proportion of women reported food cravings (78%), aversion (38%) and avoidance of certain food (22%).

A dietary intake study on Pakistani-Norwegian (PN) pregnant women revealed that Pakistani women had a significantly lower intake of vitamin D (2.2 vs 3.3 micrograms/day), calcium (793 vs 1134 mg/day), nutrition supplements (2.9 vs 7.0 micrograms/day) and lower serum vitamin D levels (19 nmol/l vs 55 nmol/l) than that of the Norwegian women, showing generalized Vitamin D deficiency in Pakistani women. In addition, 83% of the PN women were found vitamin D deficient having serum 25-hydroxyvitamin D3 levels below the reference value (< 30 nmol/l)[38].

Similar results on dietary intake of pregnant women were reported by others[39] who observed that regardless of the trimester and nutritional status, pregnant women were consuming low calories (mean 1437 Kcal/day in the first trimester; 1407 Kcal/day in the third trimester). The study further revealed that women were consuming less than the recommended amount of various foods i.e., 56% were consuming less than the recommended servings of bread and cereals, 80% less than the recommended servings of meat, 94% less than the recommended servings of milk, 96% and 94% less than the recommended servings of fruits and vegetables. In addition, undernourished women had significantly lower body mass indices than those of the well-nourished women both in the first and third trimesters.

The dietary intake and nutritional status of pregnant women were further substantiated by the fact that 22% of women were underweight[40]. Only about 49.61% of the adult non-pregnant and non-lactating women, 46.92% of pregnant women and 32.31% lactating women had recommended caloric intakes[40]. Other studies conducted on Pakistani pregnant women revealed similar results of dietary inadequacy and increased risk of adverse pregnancy outcomes[41-43]. Keeping in view the deplorable nutritional situation of pregnant women, comprehensive integrated nutrition and health care interventions are required to improve the nutritional and health status of pregnant women for desirable pregnancy outcomes and averting tragic consequences in the form of stillbirths, neonatal, infant and maternal mortalities.

Nutritional status of lactating women

Lactating women have increased nutritional requirements due to their body's increased physiological needs and for breastfeeding the baby. On average, lactating women in the first six months of lactation produce 750-800 ml of milk per day, which provides approximately 525-560 Kcal/day to the infants[44].

It has been agreed that breast milk is best for infants in terms of its ideal composition, qualitatively and quantitatively sufficient for the first six months of infants, confers immunity and reduces the risk of diarrheal diseases by four to fourteen fold and the risk of respiratory infections by five folds[45]. There is also a general consensus that healthy lactating women from developing countries produce more or less the same amount of breast milk comparable to lactating women of developed countries but maternal nutritional status has varying effects on the nutrients composition of breast milk[46-47].

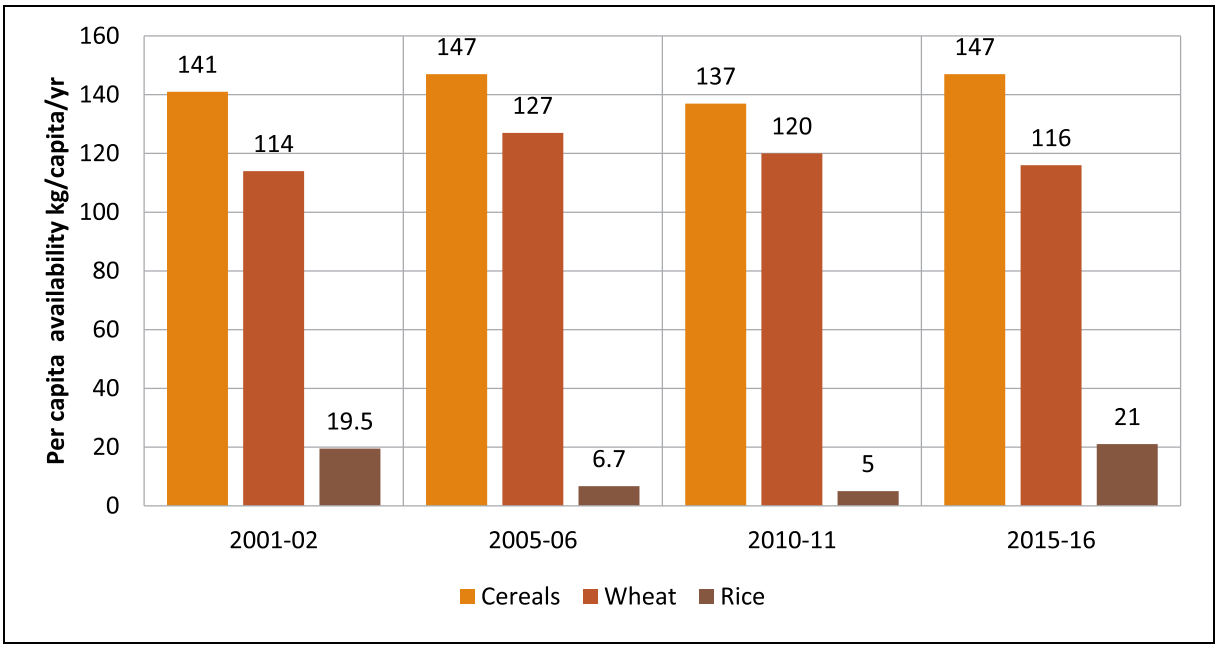
Maintenance of good maternal nutrition and health status and appropriate management of lactation is critical, pre-lacteals and formula feeding should be avoided.

Due to lack of awareness and nutrition education, lactating women pay very little attention to their diet that adversely affects the nutritional status of both the women and baby as depicted by the high prevalence of malnutrition in women and children[2,39]. Focused and targeted nutrition interventions to improve lactation management and dietary diversity with an emphasis on increased quality and quantity of macro and micronutrients are essential for the proper growth and development of infants and children.

Food availability and consumption in Pakistan

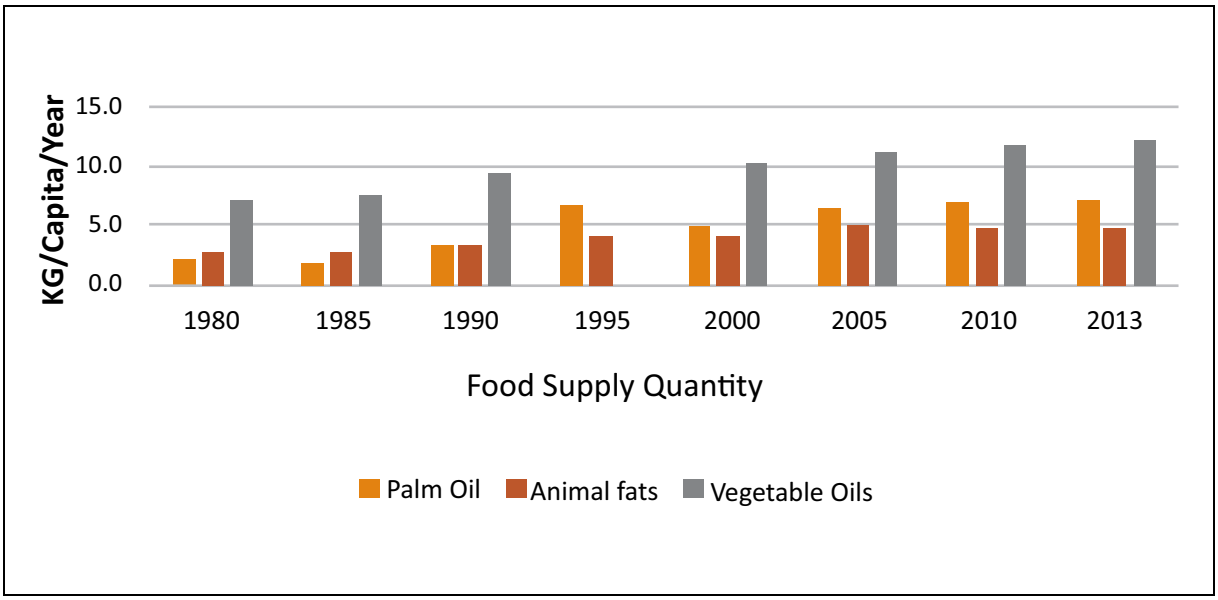
In Pakistan, food availability (kg/capita/year) has remained relatively stable over the last three decades to meet the demand of the growing population. The availability of major food items i.e., wheat, rice, maize, fats and oils, meat, milk, vegetables, fruits and pulses indicates that by and large food availability has improved over the years and as such there had been no shortage or disappearance of food from the markets (Figures 1-4)[48-49].

Figure 1 . Availability of cereals over different time periods



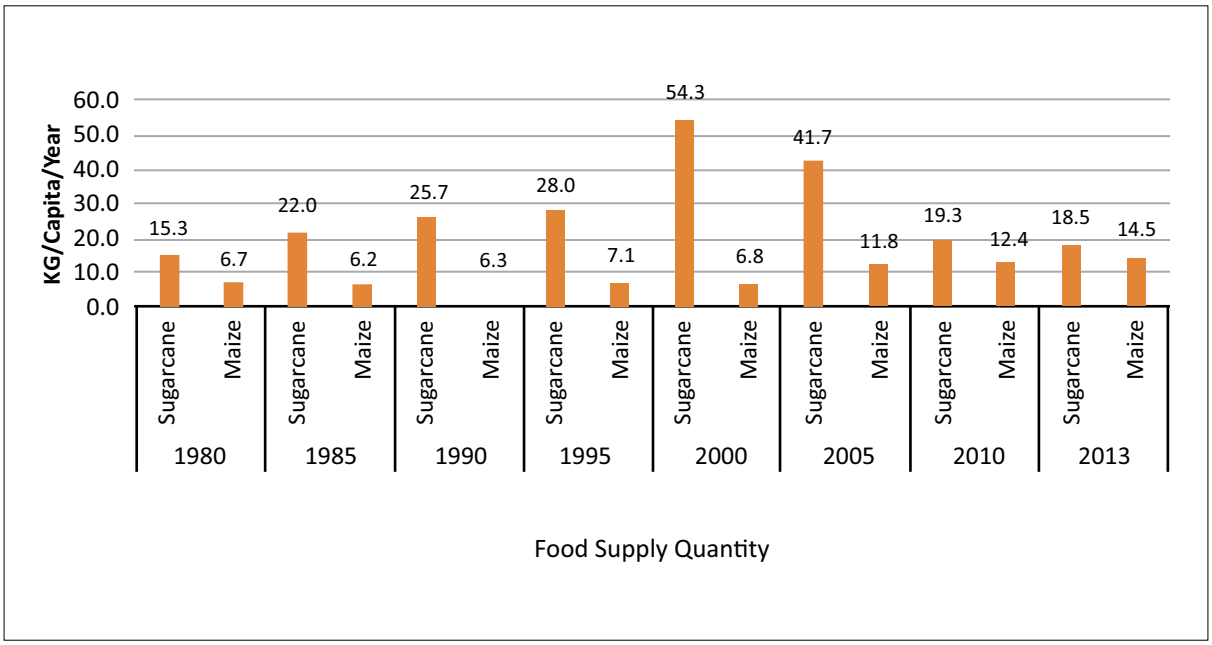
Source: MPDR, 2016

Figure 2. Availability of fats and cooking oils over different time periods



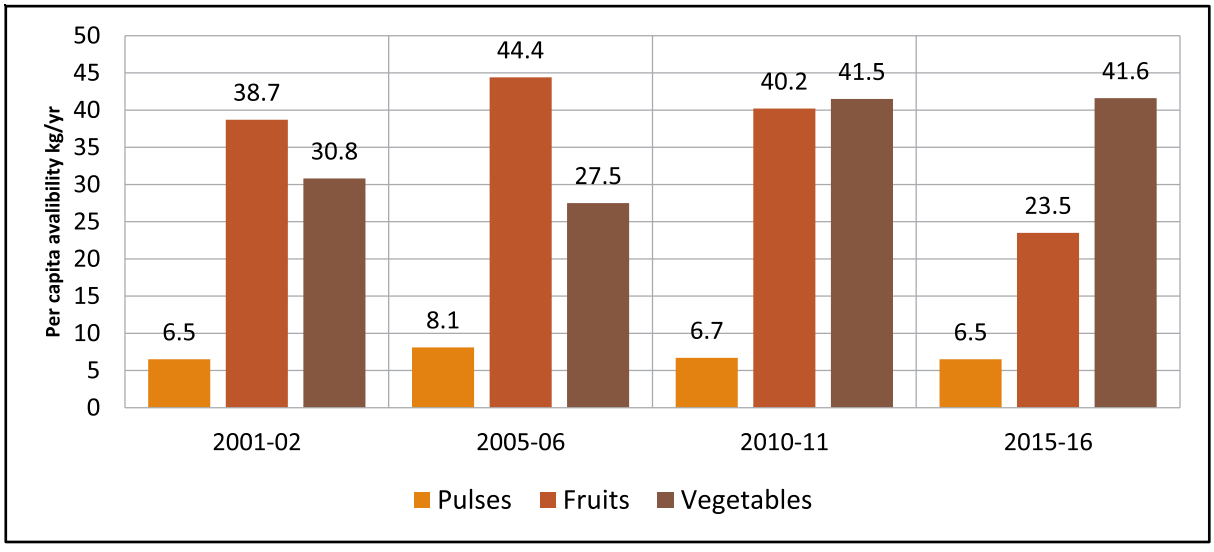
Source: FAO, 2016

Figure 3. Availability of maize and sugar over different time periods



Source: FAO, 2016

Figure 4. Availability of pulses, fruits and vegetables over different time periods

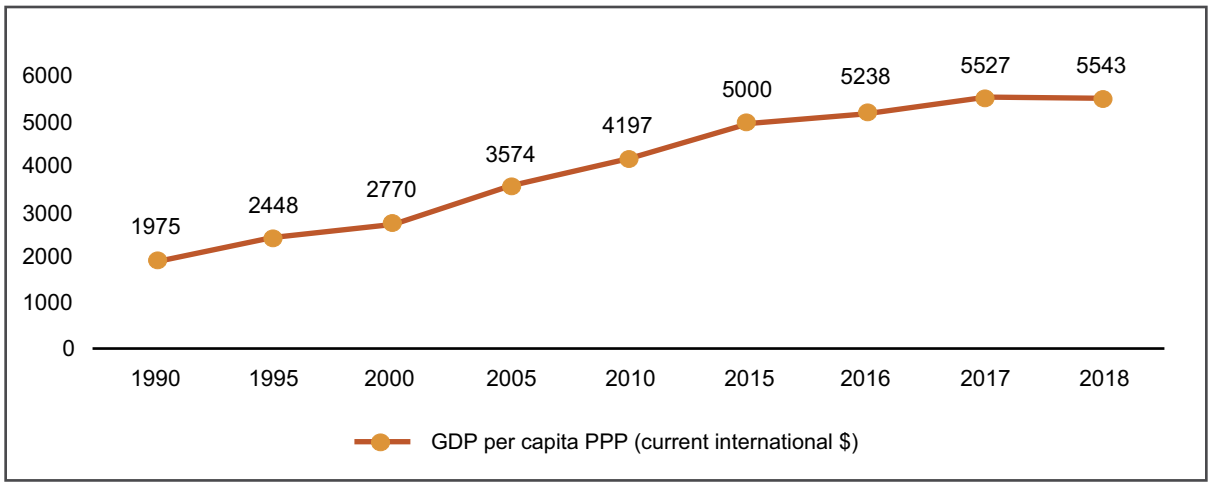


Source: MPDR, 2016

Based on the food availability data, the estimated per capita calories (2470) were available per day[50]. The availability of milk, meat, sugar, fats and oil has markedly increased over the years. The food availability data demonstrate that Pakistan does not fall under the category of food deficit countries and local production is

sufficient to meet the food requirements of the population with an exception of a few food items like edible oil, pulses and tea which are imported to bridge the demand. At the same time, an appreciable amount of rice, wheat, sugar, fruits and marine foods are exported to earn foreign exchange. The country, however, is lagging behind in the export of value added foods and there is lot of potential for value addition and export of food commodities. Although the income generated has increased over the years yet is insufficient for the common man to purchase the diversified foods and meet the recommended nutrients requirement of the body (Figure 5)[51].

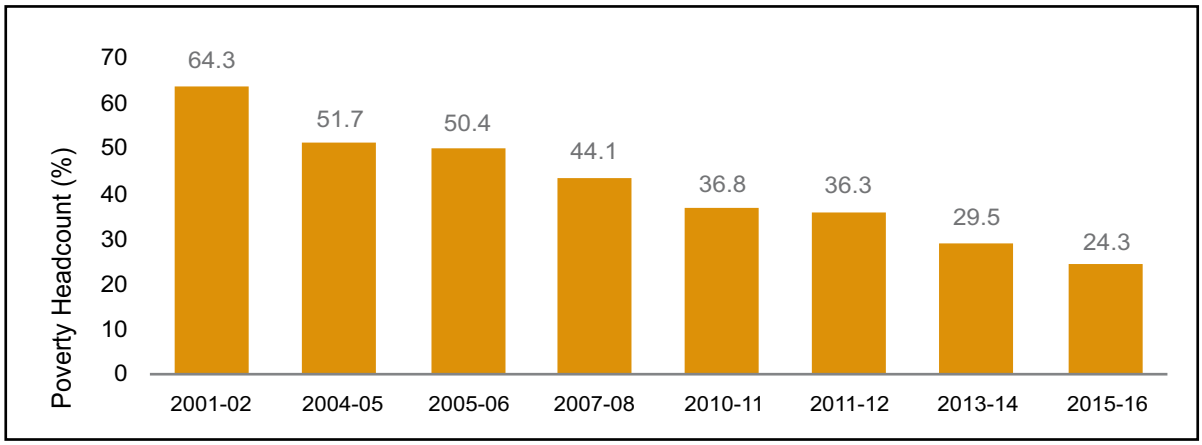
Figure 5: Per capita GDP on PPP (Current International $) from 1990-2017



Source: World Bank, 2019

Household income has been a major constraint for purchasing and consuming quality foods for majority of the population. It has been estimated through the cost for basic needs method that 24.3% of the population live below the poverty line[52]while the caloric based poverty assessment revealed that 35% of the population is unable to purchase sufficient foods to meet the nutritional requirements of the body[53] (Figure 6).

Figure 6: Poverty Headcount

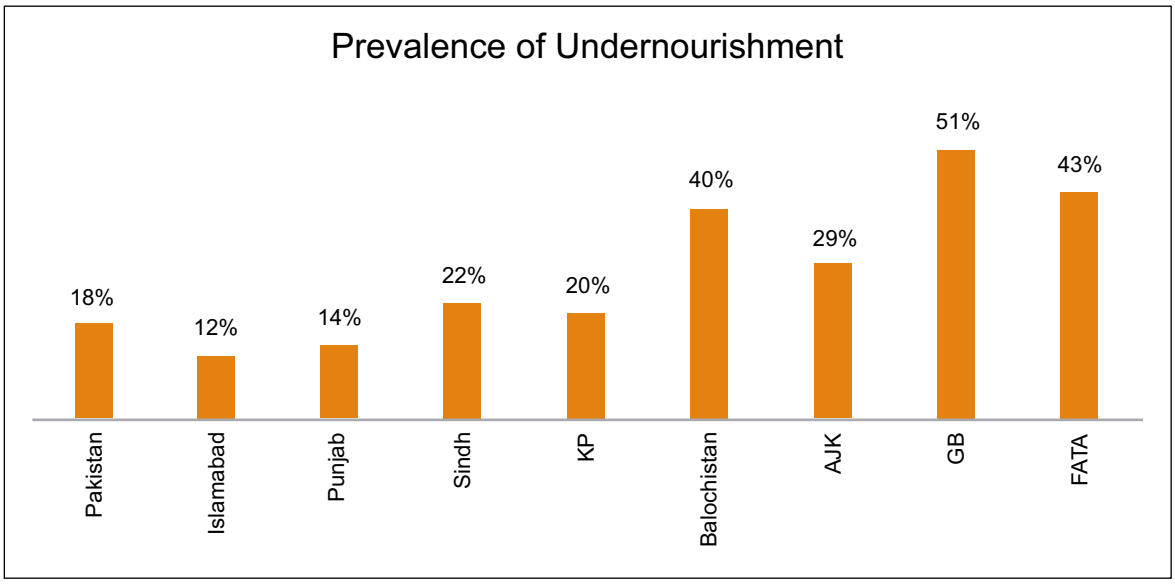


Source: MPDR, 2016

The imbalance between body's nutrient requirement and dietary intake results in malnutrition, which is affecting a large segment of the population impeding their work potential and earnings. A significant proportion of Pakistani population has a deficiency of both macro and micronutrients[2]. In other words, energy could be used as a marker of individual nutrients intake i.e., reduced energy intake would result in a deficient supply of all other nutrients.

FAO has calculated estimates of the Prevalence of Undernourishment (PoU) and of the number of undernourished (NoU) since 1974. In addition, the country level estimates of the PoU and NoU, regional as well as global aggregates are published in the State of Food Insecurity report (SoFI). The methodology for estimating the PoU is based on the comparison of a probability distribution of habitual daily Dietary Energy Consumption and a threshold level and is referred to as minimum dietary energy Requirement (MDER)[54]. In Pakistan, the proportion of undernourished in total population is estimated 18% as per Food Security Assessment made by the MNFSR following the methodology being used for the State of Food Insecurity globally by the FAO[55]. The estimated 18% PoU suggests that over 38 million Pakistani population is undernourished out of 213 million population of Pakistan[56]. The prevalence of undernourishment varies across the provinces and regions the highest (51%) being in GB and the lowest (12%) in Islamabad (Figure 7).

Figure 7. Prevalence of Undernourishment



Source: Food Security Analysis Report (Draft), 2018

Relationship between diet and disease

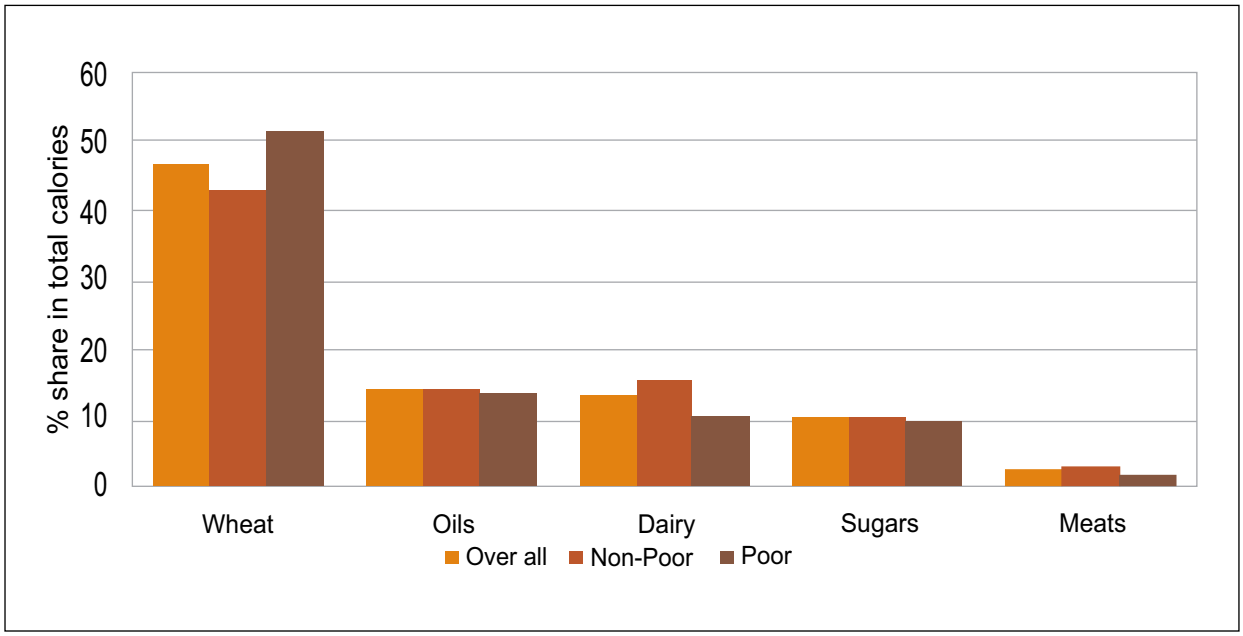
Diet has been recognized as one of the strongest predictors of health and disease but its role and importance had largely been underestimated due to unawareness, lack of knowledge, preference for traditional monotonous diets driven by economic, cultural and social reasons. Studies conducted around the world revealed that unhealthy dietary habits and physical inactivity are the major determinants of

overweight, obesity and chronic diseases and are responsible for decreased productivity and increased mortality[57].

Excess salt intake has been linked to 1.7 million deaths from cardiovascular diseases and it has been reported that a small reduction in salt intake was associated with more than 7% reduction in deaths from strokes and heart attacks[58]. Similarly, it has been estimated that at least one-third of cancer cases can be prevented by adopting healthy dietary practices and improved lifestyles[59]. Changes in dietary habits and lifestyles can make a substantial reduction in diet related chronic diseases and improvements in the nutrition and health status of the population.

Data on food consumption patterns revealed that diet of both poor and higher income (non-poor) households is predominantly comprised of energy dense foods with little diversity and therefore micronutrient deficiencies are more likely to be prevalent in the population (Figure 8)[60]. The figure indicates that wheat is the main staple providing 46 to 52% of the total daily caloric intake, oils 14 to 13%, dairy 13-10%, sugars 10% and meat 3 to 2% of the total calories for the non-poor to poor groups of population, respectively.

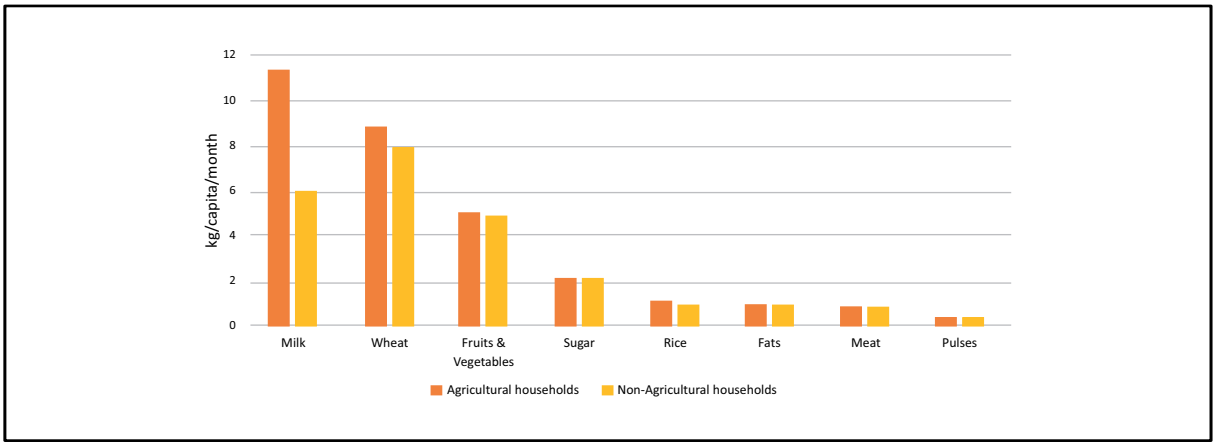
Figure 8. Calories contribution of different foods in poor and non-poor diets



Source: IFPRI, PSSP 2015

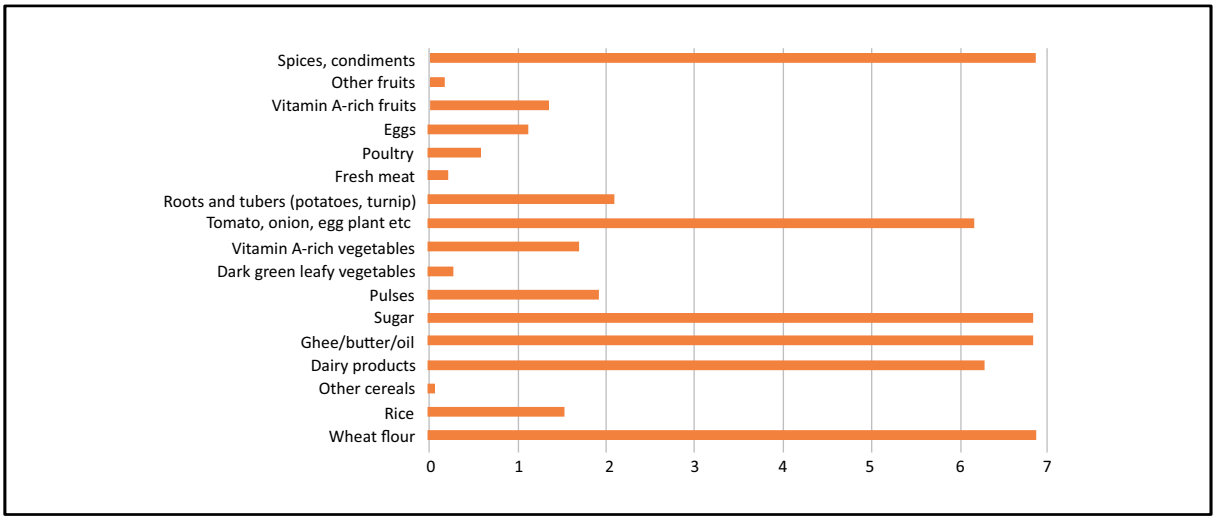
Figures 9-10 reveal that the dietary patterns of the rural population remained almost similar to that of the urban populations except that the former had a higher consumption of milk than the later which could be attributed to greater accessibility of the rural population to milk from buffaloes, cows, goats and sheep that are mostly reared in the rural areas. The figures also showed that the diet of the population was less diversified and therefore, less likely to meet all the nutrients requirement of the body.

Figure 9. Food consumption patterns of households



Source: IFPRI, PSSP 2015

Figure 10. Frequency of food consumption based on 7 days dietary recall



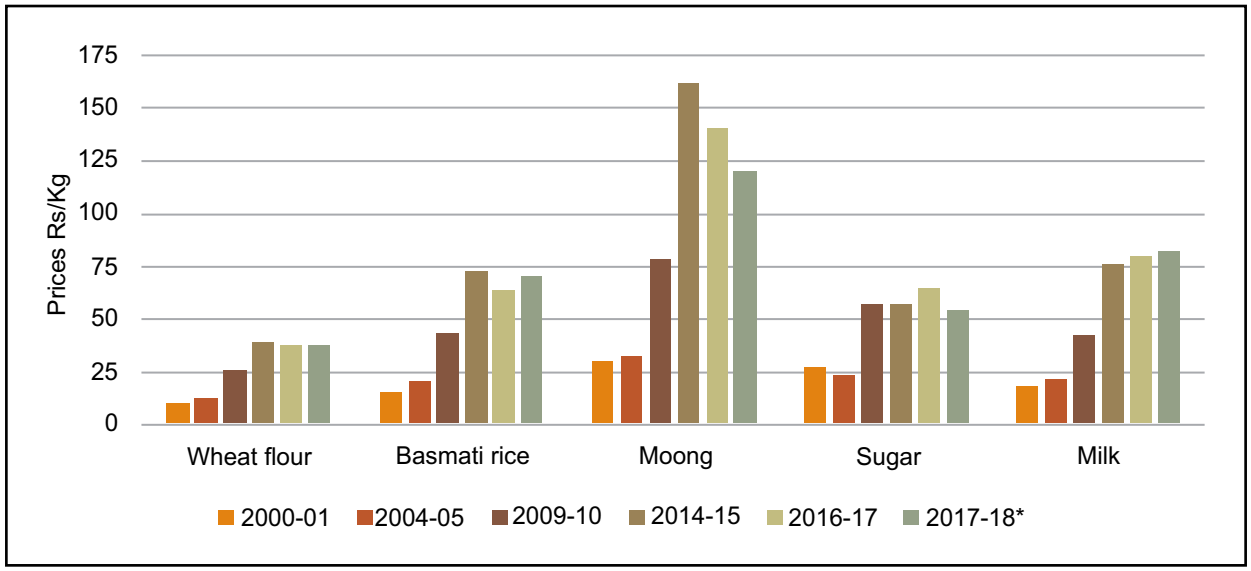
Source: IFPRI, PSSP 2015

Figure 10 depicts that consumption frequency of spices, sugars, cereals, ghee, butter and oils is the highest when food consumption over 7 days was analysed. The bars indicate unawareness of consumers with respect to the nature and consequences of foods being utilized. The predominant consumption of spices, sugars, cereals, ghee/butter/oil and less frequency of consuming green leafy vegetables, fresh meat and fruits or vitamin A rich foods indicate an unbalanced eating pattern.

Therefore, an accurate assessment of food consumption, nutrients intake and requirement of the population is crucial to formulate food based dietary guidelines to reduce the incidence of malnutrition and chronic diseases in the population. However, it is important that food should be available, accessible and

affordable at all times so that a variety of foods are included in diet to supply adequate amounts of nutrients to the body. The estimate suggests that households with low income spend over 59% of their income on energy dense foods and hardly any amount is left for education and health care of the family[60]. Besides, there has been a trend of increasing food prices which limit the purchasing power of the common man to purchase and consume nutrient dense foods that exacerbate food insecurity and malnutrition (Figure11)[61].

Figure 11: Trends in food prices over the years



Source: Pakistan Economic Survey 2017-18

*2017-18: Prices of 2017-18 are for the period of Jul-Mar

It is well established that unhealthy dietary practices and physical inactivity are risk factors for overweight and obesity and are associated with impaired metabolic functions, inflammation and increased prevalence of non-communicable disease.

Food consumption patterns (FCPs) in Pakistan shown in Figures 8-10 reveal that a majority of the population consume refined cereals, hydrogenated and un-hydrogenated oils with high consumption of salt and sugars, which are far above the recommended nutrients intake and dietary recommendations of World Health Organization[62]. The FCPs also show that consumption of vegetables, fruits, milk and milk products, meat and meat products is much lower than the recommended intake (Figures 8-10). Increased urbanization, economic and nutrition transitions have led to increased consumption of fast and processed foods, sweets and soft drinks with high energy, fat, salt and sugar content resulting in increased risks of malnutrition and chronic diseases in the country. It demands that dietary modifications may be encouraged transforming from energy dense foods to nutrients dense diversified foods that encompass a variety of food groups to meet all the essential nutrients to combat the double burden of malnutrition and chronic diseases. It requires multidimensional interventions and approaches to facilitate the dietary transition from energy dense to nutrients dense foods to control and reduce nutritional deficiencies and associated diseases. Furthermore, increased investments in social sectors are required to provide safe water, food and health

care services, including maternal child health care, and increased focus on maternal education, behaviour change counselling and nutrition promotion; the poorer sections of society including vulnerable households, marginalized populations, disabled and people living with HIV/AIDS also need social protection, access to food and diversified diet, income and job opportunities in gender sensitive manner (including women and men, boys and girls) to improve their nutrition and quality of life. This will help in reducing the intergenerational burden of malnutrition and undernutrition.

Sustainable food production systems are needed to meet the demands of growing population, healthy diet transformation, reducing food losses at the production side and food waste at the consumption side and healthy diet transformation (increasing the consumption of vegetables, fruits, legumes/pulses, nuts, seeds and whole grains)[63].

Limited enforcement of food safety regulations has multiplied the number of food vendors who may sell low quality foods in schools, markets, canteens and other public places etc., increasing the prevalence of foodborne diseases, malnutrition and mortality.

Traditional and fast foods

Fast foods may be defined as ready to eat food available in public places, food streets, food corners and restaurants. They may include burgers, pizzas, sandwiches, chat, cholay, samosas, pakoras, french fries, ice creams, doughnuts and all other traditional and non-traditional foods that are dispensed quickly. Most energy dense foods provide high amounts of refined carbohydrates, sugar and fat but are low in vitamins and minerals and dietary fibre content. Despite their low nutritional value, fast foods have become a symbol of modern culture and their taste appeal more to children and youth.

Like other countries, the consumption of fast food in Pakistan is also flourishing. According to various reports, the fast-food industry is the 2nd largest industry in Pakistan; accounting for 27% of the country's value-added production and 16% of the total employment in the manufacturing sector with an estimated 169 million consumers[64]. Pakistan holds the world's eighth largest market when it comes to fast food and food-related business. More than 1000 large-scale food processing enterprises are in operation in Pakistan[64].

Traditional foods are slowly losing their appeal, as fast foods are fascinating the population due to their convenience and easy availability. Home cooking hours have been comparatively minimized and people prefer eating outside in food streets and fast-food restaurants. Along with Pakistani foods, Chinese, and Continental cuisines have also gained a lot of liking and are becoming a part of the Pakistani menu in big cities.

The impact of fast foods on health is quite staggering when consumed on a regular basis. By replacing , fresh wholesome food with processed additive-laden food, it has been noted that blood pressure and cholesterol level increase, metabolic rate altered and the immune system is weakened.

Salt Consumption

High sodium consumption (>2 grams/day, equivalent to 5 g salt/day) and insufficient potassium intake (less

than 3.5 grams/day) contribute to high blood pressure and increase the risk of heart disease and stroke. The main source of sodium in our diet is salt. Salt intake of less than 5 grams per day for adults helps to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart attack. The principal benefit of lowering salt intake is a corresponding reduction in high blood pressure. Reducing salt intake has been identified as one of the most cost-effective measures countries can take to improve population health outcomes. Key salt reduction measures will generate an extra year of healthy life for a cost that falls below the average annual income or gross domestic product per person[32].

Glycemic index of foods

It is the ability of carbohydrate containing foods to raise the body's blood glucose levels after their consumption. Foods by virtue of variations in the quality and quantity of carbohydrate contents yield different glycemic indices upon their consumption. In general, refined cereals/grains (white bread, white rice, spaghetti and processed foods) have a higher glycemic index than whole cereals/grains (whole wheat bread, brown rice). Foods are classified as having high (GI 70 or more), medium (GI 56-69) and low (GI 55 or less) glycemic indices[65]. Foods with high glycemic indices put greater stress on the body to secrete greater amount of insulin to maintain the rising blood glucose level to a normal blood glucose level. In addition, increased carbohydrates intake adversely affects glucose and lipid metabolism resulting in higher risk of cardiovascular diseases[66]. Conversely, low glycemic index diets have been associated with improving the overall blood glucose control in people with diabetes[67].

Food allergy

The abnormal response or reaction triggered by the body's immune system to certain foods is called food allergy. Foods that cause allergy are called allergen. The allergic reaction may be of varying intensity from mild to severe, may affect any part of the body and could be for a shorter or longer time period. Skin, gastrointestinal tract, cardiovascular system and respiratory tract are more commonly affected. Food allergy affects about 4-6% of children and adults[68].

The common symptoms include skin irritation and rash, itchy sensation in the mouth, swelling of the lips, tongue or throat, shortness of breath, trouble breathing, flushing, wheezing, stomach pain, vomiting and diarrhoea etc. Immunoglobulin E and other antibodies mediate these reactions. Foods that often trigger allergic reactions are milk, eggs, peanuts, nuts, fish, soy, wheat and shellfish (shrimp)[69].

Unprocessed and processed foods

Pakistan is a small but growing market for imported consumer food products and the small modern retail sector is growing slowly. Rising incomes, urbanization, and a young populace are combining to slowly shift traditional consumption patterns away from bulk and raw foods towards packaged and processed foods, including ready-to-eat meals and frozen foods.

A typical Pakistani household makes regular purchases of staple foods (i.e., wheat flour, pulses, edible oils, fruits, vegetables, milk, and meat) several times per month from neighborhood stores due to convenience, perceived freshness, and limited storage space at home. Young Pakistani professionals (men and women)

are making monthly food purchases from modern retail stores due to a greater variety of available products, access to restaurant/food corners and prepared foods all under one roof. For urban dwellers with a sufficient income, one-stop grocery shopping is catching on as a family outing.

Affluent Pakistani families are attracted to modern retail stores due to their affordability, strategic locations, variety, and access to imported processed foods. The demand for specialty and high value foods such as dates, cereals, beverages, chocolates, almonds, cakes, fruits and fruit juices reaches its peak during the Islamic festive season, especially at Eid and Ramadan. These festivals revolve around the year depending on the lunar calendar. Fresh foods, fruit juices, fruit concentratebased beverages, organic foods, sugar-free confectionaries, packaged food with higher fiber content, dairy products, and vitamin and calcium fortified packaged foods and beverages are all gaining acceptance among high income consumers.

Traditional and modern snack foods, such as confectionaries, pastries, cakes, biscuits, ice cream, or sweet and savory snacks are very popular among Pakistanis. Frozen foods and instant noodles, which are easy to prepare for children, are popular among working mothers. Local flavors are preferred and local food manufacturers are exploring opportunities to produce new products using a combination of local and imported flavors. The rise of the urban middle class has increased the acceptance of packaged, convenience, and ready-to-eat food products. Many Pakistanis are quite willing to try new foods while eating out but often return to traditional foods at home. Chinese, Italian, Thai, Moroccan, and Lebanese foods are among the fastest growing new cuisines in Pakistan.

Multinational companies have also been successful in capturing the local food markets in Pakistan, which are encouraging youth to go for processed foods. Frequent consumption of processed foods is injurious to health due to the excessive use of salt, free sugars and other additives to increase the shelf life of the products. While Pakistan is slowly switching to processed foods, a reverse trend is being noticed in the Western world with many countries promoting greater use of organic and homegrown natural foods. More and more consumers are buying fresh produce from the many farmers' markets that have sprung up in urban areas.

To fight the epidemic of obesity, consumers are constantly reminded to reach out for fresh fruits and vegetables while avoiding sugary drinks and fried items. Making healthy food choices is vital to control this growing epidemic. Processed foods are treated with multiple chemicals to give them colour, taste, longevity and freshness and thus are exposed to energy-intensive processing. In addition to this, cardboard packaging often contains chemicals called di-iso-propylnaphthalenes (DIPNs), which can migrate into the food contents rendering it unhealthy for consumption[70].

Nutrition labeling

Nutrition labelling is information printed on the packages by food manufacturers to inform consumers about the name and total amount of food, list of ingredients, its nutritional value/contents, the percentage of daily nutrients reference values per 100 g, per 100 ml or per package of the food. In developed countries it is mandatory for the food industry to label all pre-packaged foods with their nutrients composition that are marketed for human consumption. Nutrition labelling assists consumers in the selection of foods according to their taste, liking and nutritional needs. It enables consumers to make wise choices and take

informed dietary decisions. It provides information on the amount of nutrients such as sugar, salt, saturated fatty acids, cholesterol, trans fatty acids, the increased levels of which are considered harmful to health. The information on labelling varies from country to country determined by the respective food regulatory departments.

Overweight and obesity

Energy intake greater than body requirements leads to an increased risk of overweight and obesity, which are strongly linked with an increased incidence of diabetes, hypertension, coronary artery disease, cancers and many other chronic non-communicable diseases. In Pakistan, consumption of energy dense foods (sweets, bakery products, fried foods, fast foods and overuse of oils and ghee in cooking) in combination with sedentary lifestyles are the main causes of overweight and obesity. It has been estimated that about 1/3rd of the adult population is overweight and obese[2]. Weight management through diet and lifestyle modifications is most effective in preventing and treating overweight and obesity.

Body mass index (BMI) is a measure of body's nutritional status assessed by taking weight of adults in kilograms divided by height in meters square. WHO has proposed the following classification to categorize adults into underweight, normal (weight), overweight and obese[71].

Figure 12. Body Mass Index Classification

Group	BMI
Severely thin	<16.0
Moderately thin	16.0-16.9
Mildly thin	17.0-18.4
Underweight	Less than 18.5
Normal	18.5-24.9
Overweight	>25
Pre-obese	25.0-29.9
Obese Class I	30.0-34.9
Obese Class II	35.0-39.9
Obese Class III	≥ 40.0

Measurement of waist circumference is another useful indicator of assessing abdominal obesity. Excess abdominal fat is an independent risk factor for chronic diseases. Men having a waist circumference greater than 94 centimetres and women having a waist circumference greater than 80 centimetres are at a greater risk of metabolic syndromes, diabetes, hypertension and cardiovascular diseases[72].

However, in 2004 a study by WHO concluded that these there is a high risk of type 2 diabetes and cardiovascular disease among Asian groups at a BMI lower than 25 kg/m^2. BMIs of 23 kg/m^2, 27.5 kg/m^2, 32.5 kg/m^2 and 37.5 kg/m^2 were recommended as 'public health action points' by the World Health Organization[73]. These are the triggers for health professionals to intervene to help people manage their weight through, for example, physical activity and healthy eating. The categories WHO suggested for people

from Asian groups are: 18.5–22.9 kg/m^2 (increasing but acceptable risk); 23–27.4 kg/m^2 (increased risk); and 27.5 kg/m^2 or higher (high risk of developing chronic health conditions[73]). Caloric reduction and increase in physical activity are two well-established and successful interventions to reduce and control overweight and obesity. Reducing caloric intake without affecting and compromising other nutrients intake would be a useful strategy for weight management. An individual's nutritional assessment is required for prescribing any dietary regimen; however, for prevention of overweight and obesity, it is important that an individual should follow PDGN on a regular basis. For treatment of overweight and obesity, weight loss therapy through dietary and lifestyle modifications has proven effective in reducing biomarkers of inflammation and better management of cancers, diabetes and cardiovascular diseases[74].

Physical activity and lifestyle behaviour

Physical activity is vital for weight management, bone and muscle strength, optimal physiological functions, emotional wellbeing and good health. Sedentary lifestyles promote overweight and obesity, impair metabolic functions and increase the risk of chronic diseases. Physical inactivity is the fourth leading risk factor for global mortality and has been associated with non-communicable diseases, metabolic disorders, and mental diseases[75]. Evidence shows that engagement in optimum levels of physical activity improves cardio-respiratory and muscular fitness, bone health, metabolic functions and mental health. Weight reduction minimizes health risks and helps in better management of chronic diseases[76].

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Regular physical activity is one of the major contributors to wellness, quality of life and disease prevention. Moderate physical activity can lower the risk of heart disease, stroke, diabetes, osteoporosis, dementia, and numerous cancers. Though there are immediate benefits of physical activity, the majority of prevention and health benefits are achieved when it is practiced lifelong[77].

Economic and nutrition transition in both developed and less developed countries have caused substantial changes in dietary patterns and lifestyles of the people from complex unrefined foods to more refined and processed foods, manual physical work has been replaced by mechanical work and outdoor games are replaced by indoor sedentary computer games. These changes have been responsible for the pandemic of metabolic syndromes and chronic diseases affecting millions of people around the world with impaired physical and cognitive functions, increased morbidity, heavy burden on the health care systems and premature deaths[78].

The development of healthy eating behaviour and physical activity patterns helps to optimize health status and promote mental and physical wellbeing. Unfortunately, the population by and large is actively engaged in unhealthy eating behaviours such as frequent dieting, meal skipping and frequent consumption of foods high in total and saturated fats, sodium and sugar[25, 79]. Physical inactivity is also very common particularly among adolescents.

In order to meet the challenge of improving physical activity and promoting healthy dietary habits, integrated efforts of parents, educators, health care providers, schools, communities, the food industry, policymakers and the people themselves need to be strengthened, all working together to create more opportunities for healthful eating and healthy lifestyles[75].

Promotion of healthy lifestyles in children focuses predominantly on proper nutrition and physical activity, elements now widely recognized as essential for a healthy life. Systematic reviews have shown that a healthy lifestyle such as increased levels of physical activity, a healthy diet, reduced stress and better sleep enhance general well-being[80].

There is limited data on physical activity in the Pakistani population. Moreover, the tools for assessing physical activity have not been validated in the Pakistani setting. It is therefore important for future epidemiological surveys that such tools be developed, standardized and validated. Physical activity offers additional advantages for risk reduction in the Pakistani population since the highly prevalent risk factors amongst this population such as low HDL, central obesity and insulin resistance respond better to exercise. Stepping up physical activity in a population necessitates bringing a cultural change. This has two-fold implications; the first involves modification of lifestyles and the second, creation of a physical and social environment conducive to physical activity and gender needs.

Smoking and smokeless tobacco use

Smoking has long been implicated as a risk factor for many chronic diseases, including cardiovascular, respiratory and gastrointestinal diseases and a variety of cancers. Smoking alone is responsible for 10% of cardiovascular diseases[81] and those who smoke 20 or more cigarettes daily have two to three-fold higher risk of CAD[82]. Tobacco smoke contains many oxidants and free radicals that can cause damage to lipids, proteins, DNA, carbohydrates and other bio-molecules. The annual death toll attributable to tobacco use is about 6 million while more than 600,000 are non-smokers being exposed to second-hand smoke[83]. In addition, it has been estimated that 80% of 1 billion smokers worldwide live in low to middle-income countries. The devastation caused by tobacco goes much beyond this picture with implications for individuals, societies and the health systems in general. In Pakistan, it has been reported that 45% of men and 6% of women smoke some type of tobacco[84] which are lower than previously reported studies that indicated 54% men and 20% women using tobacco in one form or the other. The prevalence of smoking increased with age among both men and women. Men in the age range of 25-44 years had the highest prevalence of smoking (cigarettes, hukka and beedis) whereas with respect to women, prevalence was highest between the ages of 45-64 years[82] It was also reported that smoking was more prevalent in rural than urban areas and illiterate than literate populations[84].

Cigarette smoking constitutes the single most important modifiable risk factor for coronary artery disease (CAD) and is the leading preventable cause of early deaths. Smoking has a particularly staggering impact in the less developed countries, almost half a billion individuals worldwide will eventually die of smoking-related complications[82]. Even among non-smokers, it has been recognized that inhaled smoke, whether from passive exposure or from direct consumption greatly increase the risk of CAD.

Moreover, these effects depend on the dose; consumption of as few as one to four cigarettes daily increases

the risk of CAD. Smoking acts synergistically with oral contraceptive agents, placing younger women at an even higher relative risk. In addition to myocardial infarction, cigarette smoking directly relates to increased rates of sudden death, aortic aneurysm formation, symptomatic peripheral vascular disease and ischemic stroke[85].

Food safety and hygiene practices

Food safety is an important pillar of food security. It ensures the availability of food that is safe, free from infectious agents and fit for human consumption. Access to safe foods and safe drinking water is essential for preventing infectious and chronic diseases. Microbiological and chemical contamination is a major cause of food and water borne diseases. Unsafe food contains harmful bacteria, viruses, parasites and chemical substances causing more than 200 diseases ranging from diarrhoea to cancers[86]. It has been reported that contaminated food and water affects millions of people around the world resulting in 4 million deaths in which developing countries take a major share[87-88].

Food hygiene is not given due importance neither at the household level nor at the commercial (restaurant, food streets and other outdoor eating places) level. Personal and food hygiene (equipment, utensils, food handling and kitchen surfaces) practices before, during and after cooking are far below the desired quality standards. Vegetables, fruits, meats and other raw foods are not properly washed, cleaned and stored. Water used for cooking is not clean and safe. Poor food storage systems in homes and restaurants increase people's vulnerability to frequent food-borne diseases and increase mortality. In addition, at the national level there are no food safety policies, strategies and work plans to implement and protect public health from consumption of adulterated and contaminated foods.

Promoting good personal and food hygiene practices at all levels of food handling starting from farm to table i.e., production, transportation, processing, storage and marketing is not only crucial for ensuring food security but also for human safety and survival. All food industries, cafeterias, restaurants, food streets and food vendors should be bound to follow good hygiene and food safety practices during food handling, cooking and servings to the public. Food safety rules and regulations pertaining to the prohibition of exposing food and beverages in the open air and sun and not properly covering or protecting them shall be included and implemented strictly at all levels of food and beverage production and marketing. Rigorous monitoring and implementation of food safety laws at all levels of the value chain are fundamentally important for ensuring a regular supply of safe food and clean drinking water to the public.

Sensitization and capacity building of officials from the ministries and departments related to agriculture, food, health, education and industry, food vendors and workers involved in food industry are essential for promoting good hygiene practices and providing safe food to the public. The food industry shall also be bound to label all foods and beverages produced in the country and a stringent policy of collecting and analysing food and water samples for pathogens, adulterants and contaminants shall be adopted at all levels of production and marketing. Public awareness to adopt and promote good hygiene practices through electronic, print and social media would be useful and effective means of educating people to adopt good hygiene.

Good personal and safe food guidelines are given in Annexure-I.

Water, sanitation and hygiene

Water is a basic necessity of life, which must be clean and safe for human consumption. It should be free from pollutants, industrial wastes, physical, chemical and microbial contaminants that are injurious to human health. Consumption of water that is contaminated with animal and human excreta is a major source of pathogenic bacteria, viruses, protozoa and helminths and results in epidemics of waterborne diseases. The organisms most commonly found in water contaminated with sewage are Escherichia coli and the coliform group as a whole[88].

It has been reported that in Pakistan 20 to 40% beds in hospitals are occupied by patients suffering from water borne diseases especially during the summer months[89]. Unfortunately, most of the water sources are contaminated and there is no proper system to ensure the supply of clean drinking water to the marginalized populations. Estimates also suggest that in Pakistan a quarter of all the people visiting hospitals are suffering from water-related diseases as a result of poor sanitation and lack of safe drinking water facilities[90].

Countries providing clean water and sanitation have greatly reduced child morbidity and mortality. The environmental pollution in Pakistan has exacerbated the prevalence of chronic diseases and increased mortality[91]. Improper waste disposal system, lack of safe drinking water, and lack of awareness about health and nutrition are the major concerns. The use of contaminated water and exposure to a polluted environment increase the risk of diseases such as diarrhoea, dysentery, malaria, respiratory infections, influenza, and hepatitis. It is estimated that 45% of the total population in Pakistan does not have access to health services, 40% are deprived of safe drinking water and 53% are living without sanitation facilities[91]. Drinking water is considered safe when it is free from microorganisms as well as from toxic chemicals of industrial wastes and heavy metals that are injurious to health. Avoidance of untreated drinking water and surface and groundwater is essential because of contamination with industrial wastes, chemicals and microorganisms. Water at the point of origin must be treated by antimicrobial and anti-contaminant agents. At home drinking water can be made safe by boiling or chlorination or installing membrane filters or by thermal treatment. Chlorination at a concentration between 0.2-0-5 mg/L from normal to high risks circumstances is recommended[92].

The maximum allowable concentration of lead, selenium, arsenic, chromium and cyanide in drinking water are 0.1 mg/L, 0.05 mg/L, 0.2 mg/L, 0.05 mg/L and 0.01 mg/L respectively, drinking water containing metal concentrations above these limits shall be considered unfit for human consumption[88].

METHODOLOGY

Under Scaling up Nutrition (SUN) initiative, the Nutrition Section, Ministry of Planning, Development and Reform (MPDR)/ Planning Commission and Food and Agriculture Organization of the United Nations (FAO), along with Ministry of National Health Services, Regulations & Coordination, provincial departments, Azad Jammu and Kashmir and Gilgit Baltistan joined hands in formulation of Pakistan Dietary Guidelines for Better Nutrition (PDGN). Brainstorming workshop was held in which renowned experts from the ministries, academia and research institutions, health & planning and development departments, representatives from UN and international and national non-governmental organizations participated. A comprehensive presentation on dietary guidelines (DGs) was given and working groups were constituted for deliberation and eliciting their inputs. The members participated to review the previous DGs, identify gaps and suggest how new DGs should be developed for the country. In the light of participants' suggestions, a framework for PDGN was developed. Consultative workshop was convened to review and refine the framework and contents of the PDGN.

Food consumption patterns, nutrients intake, physical activity, lifestyle, recommended dietary allowances, diet and disease, nutrition and health problems were taken into consideration. The review of available literature to fully understand the existing situation of dietary intake, the relationship between diet and disease, nutritional and health status of the population, was carried out for compilation of the document. Review of literature provided necessary inputs and up-to-date snapshot of the nutrition and dietary practices of the population, and the difficulties and challenges that could arise during the development of PDGN.

On the basis of existing nutritional status of the population in Pakistan (dietary patterns, nutrient intakes, dietary recommendations, prevalence of malnutrition and diseases) in the country, and dietary recommendations/ guidelines of WHO/FAO[93], the dietary guidelines were formulated to promote healthy dietary practices, prevent rising incidence of overweight/obesity and non communicable diseases (diabetes, hypertension, cardiovascular diseases, cancers, rickets, arthritis, osteoporosis and other diet-related diseases).

Consensus building workshop was conducted in which technical experts, planners and policy makers from universities, research institutions, Ministries of PD&R, Health, Provincial Departments, Azad Jammu and Kashmir and Gilgit-Baltistan were invited. A comprehensive presentation on dietary guidelines was given and working groups were constituted for deliberation and eliciting their inputs. Dietary guidelines document was critically reviewed and modified to incorporate the relevant recommendations.

PDGN remained a live document until August 2019, which is finalized having further suggestions/inputs making it comprehensive enough for the understanding of the population about the basic food and nutrition concepts in a simple, easy and user-friendly manner. Skilled professionals/researchers can consult other data sources as well for additional information and knowledge. The dietary guidelines are modifiable according to the changing lifestyle, dietary habits and available latest data sources and information. The revision will be considered every five years on required basis.

PAKISTAN DIETARY GUIDELINES FOR BETTER NUTRITION (PDGN)

The PDGN are set of dietary recommendations to meet the nutrients requirement of the population through improved dietary practices and healthy lifestyles. The PDGN aims to improve the nutritional status of the population by ensuring that sufficient amounts of nutrients are provided to the body by an intelligent and informed food choices and adoption of healthy lifestyles and behavioural practices. Food based interventions are safe and risk free, non-invasive, cost effective, sustainable, culturally acceptable and far less expensive as compared to therapeutic treatments. The review of data suggests that dietary patterns of the Pakistani population may not be appropriate, many times in terms of quality and quantity to meet the body needs. Nutrition data also revealed that diets were unable to provide adequate amount of essential macro and micronutrients to the consumers, which is reflected in the general population as higher prevalence of underweight, wasting, and stunting combined with widespread nutritional deficiencies in women and children[2]. The deficiencies fall under the category of public health problems that need to be reversed through integrated, comprehensive dietary interventions (development and dissemination of food-based dietary guidelines, nutrition education, dietary counselling and behavioural change).

Health status indicators also highlight that there has been surge in communicable and non-communicable diseases affecting almost all age groups of the population. Women and children are more vulnerable to nutritional and health problems owing to their increased requirement, decreased intakes, low access to health care facilities, poverty and unawareness. Prevalence of overweight and obesity, hepatitis, malaria, tuberculosis, diabetes, hypertension, cardiovascular diseases and cancer is multiplying with the passage of time that tend to have far reaching social, psychological and economic consequences on the society and the country.

Food and food groups

Food is essential for providing nutrients like carbohydrates, proteins, fats, vitamins and minerals, which are vital for growth and development, health and survival. None of the food on their own are capable of providing all the nutrients in an adequate amount to fulfil the body's requirements. It is important to maintain a balanced diet by eating a variety of foods in an adequate amount for nourishing the body on the whole. In general, food may be divided into five basic groups that include cereal grains and products; vegetables; fruits; meat, pulses and eggs; milk and milk products.

Each food group has a unique nutrients composition that is different in quality and quantity from other food groups. All food groups are known for providing specific key nutrients e.g., meat is mainly a source for animal protein, cereals for carbohydrates, pulses for plant source of protein and fruits and vegetables are a good source of vitamins and minerals, although other nutrients are also present invariably in all of these food group examples. Oil and Fat are also included in the food group description as it is one of the ingredients in Pakistani cuisine, concentrated source of energy (double to carbohydrates and protein) and essential fatty acids for the body, therefore should be used in moderation.

A brief discussion of each food group is given below:

Cereal grains and grain products

Cereal grains and grain products include wheat, oats, rice, rye, barley, millet, and corn. These grains can be cooked and eaten as whole; or ground into flour to make a variety of cereal foods like bread, chapatti, naan, pasta and noodles, or made into ready-to-eat breakfast cereals. Wheat, rice and maize are the most commonly consumed cereals in Pakistan. They are the main source of energy, carbohydrates, dietary fibre, protein, vitamins and minerals. Cereals provide over 50% of total energy and protein per day to human body in Pakistan[50].

For healthy individual, energy balance is important for maintaining desirable body weight; preventing under-nutrition, overweight and obesity. Whole grain cereals are good source of dietary fibre, contribute to maintain normal gut movement, and cholesterol level, reduce faecal transit time with rapid excretion of toxic substances and prevent the incidence of colorectal cancer in addition to indirect benefits of maintaining blood pressure[94]. Cereals grain and products are energy-dense and thus inadequate or excess intakes may lead to harmful effect on health.

Vegetables

Vegetables include leafy and non-leafy vegetables with different colours (green, yellow and red) and properties. The leafy vegetables include dark green vegetables (spinach, fenugreek, mustard green, broccoli, lettuce), red and orange vegetables (tomatoes, carrots, and squash). Non-leafy vegetables include carrots, turnips, pumpkin, reddish, garlic, ginger, onion etc. Legumes including beans and peas (black beans, split peas, and soybeans). Vegetables are rich in vitamins, minerals, dietary fibre, water and phyto-chemicals that protect the body from oxidative damage, infections or chronic diseases. Vegetables are protective foods as they protect the body from infections and chronic diseases.

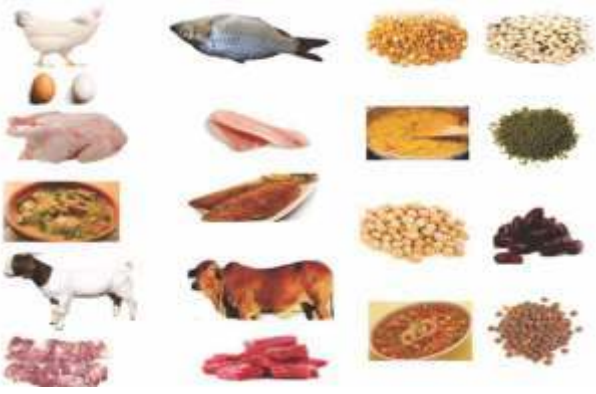
Fruits

Fruits group includes fresh, frozen, canned and dried fruits. Fruits are a good source of energy, dietary fibre, potassium, vitamins and minerals. They also contain phytochemicals, scavenge free radicals to reduce oxidative stress, and protect the body from oxidative damage and reduce the risk of cancers and other chronic diseases. Fruits are also classified as protective foods as they protect the body from infections and chronic diseases.

Milk and milk products

Milk and milk products are the food group with a significant role in the diet. It includes milk, yogurt, cheese, custard, lassi (buttermilk) and other milk-based foods. These are good sources of protein, calcium, phosphorous, magnesium, vitamins and minerals. An adequate amount of milk and milk products are recommended to prevent incidence of rickets in children, osteomalacia and osteoporosis later in life due to deficiency/low intake of vitamin D, calcium and phosphorous.

Meat and pulses



It includes all kinds of meat (mutton, beef, poultry) and organs, fish, eggs, and pulses (chickpea, red beans, lentil, mash, mung beans) that are a rich source of protein and are considered as body building foods. Besides protein, meat and pulses also provide vitamins and minerals. Eggs are highly nutritious food and considered as good source of total bioavailable protein. An adequate amount of meat, fish, eggs and pulses should be taken to reduce and control kwashiorkor, stunting, anaemia and zinc deficiencies. Although meat and pulses are protein sources but they are very different in terms of nutritional value. Pulses and legumes also provide dietary fibre, and are associated with reducing LDL cholesterol and blood pressure, and lower risk of coronary heart disease and chronic health

disorders. Animal protein is of higher quality (amino acid patterns and digestibility) than plant proteins, and the body more easily absorbs iron and zinc from animal sources. Animal source foods are associated with improved growth, micronutrient status, cognitive performance, motor development, and increased activity in young children.

Oil and Fat

Edible oil and fat are an essential part of the Pakistani diet in relation to traditional foods and recipes. They are concentrated source of energy, double to calories of carbohydrates and protein i.e. provide 9Kcal/gram of whereas carbohydrates and proteins provide 4Kcal/gram). Oil and fat provide essential fatty acids and essential for the absorption of fat-soluble vitamins. Fat are esters of fatty acids and glycerol (monoglyceride, di-glycerides and triglycerides) classified into saturated and unsaturated fatty acids. Saturated fatty acids are predominantly present in animal fat (butter and ghee), hydrogenated fat (ghee) and vegetables oil (coconut oil, and palm oil). High intake of saturated fatty acids results in synthesis of bad fat i.e., low-density lipoprotein (LDL) in the body which has been identified as a risk factor for cardiovascular diseases. Vegetable oils (soybean, sunflower, corn, olive, rapeseed, and sesame seed oil) are high in unsaturated fatty acids and considered superior over saturated fatty acids as the former promotes the synthesis of good fat i.e., high-density lipoprotein (HDL) in the body.

Fat and oil are made up of essential and non-essential fatty acids. Oleic, linoleic and linolenic acids are essential fatty acids not synthesized by the body and must be supplied through the dietary sources as they are vital for performing a variety of physiological functions i.e., cell membrane, development and functioning of the brain and nervous systems. Furthermore, they play an important role in suppressing inflammation and prevent degenerative changes in the body. The composition of fatty acids determines the quality of fats and oils. Fatty acids are also divided into cis and trans fatty acids, the former promotes the synthesis of good fat i.e., high density lipoprotein (HDL) and the later leads to bad fat i.e., low density lipoprotein (LDL) production in the body. Trans fatty acids are produced when oil is transformed into solid fat by industrial processing; hydrogenation or when oil and fat are overheated or fatty meat is cooked and consumed. Trans fat is typically high in commercially hydrogenated foods (margarine, snack items, fast food and many other food products). Trans fat pose a number of negative health impacts, associated with increased risk of cardiovascular diseases.

Fatty acids are also classified into omega-3, omega-6 and omega-9 on the basis of the location of double bonds in the fatty acid chain. The alpha-linolenic fatty acid is omega-3 essential fatty acid that is converted into docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) in the human body that are essential for brain and nervous system functions. Linoleic acid is omega-6 fatty acid found in vegetable oil, grains, and nuts while oleic, and erucic fatty acids are omega-9 non-essential fatty acids. A list of foods rich in omega-3,

omega-6 and omega-9 fatty acid is given as Annexure II.

Recommended dietary allowances

Recommended dietary allowances (RDAs) refer to the average daily intake level of a particular nutrient that is likely to meet the nutrient requirements of 97-98% of healthy individuals in a particular life stage or gender group. They are derived from epidemiological studies, which are based on determining mean nutrients intake of the reference population i.e., large nationally representative sample of population to which two standards deviations are added to balance an individual difference and set nutrients required for the general population; with an exception to energy requirements set equivalent to average energy expenditure of a healthy reference population.

Knowledge of nutrients requirement by different age groups is essential for transforming nutrients into portions of foods required by each age group. Nutrients requirement by different age groups are described below to facilitate the understanding of developing PDGN. Recommended dietary allowances for Pakistani population as given in the Food Composition Table for Pakistan[95] are reproduced as Annexure-III while dietary reference intakes for different age groups as recommended by Food and Nutrition Board/National Research Council, Institute of Medicine, Washington, DC. are also reproduced as Annexure-IV[96] to provide additional information to the reader.

Infants (0-6 months)

Early infancy covers the period from birth to 6 months, characterized by rapid body growth and development. During this period, infants on an average gain about 4-5 kg weight and 15-16 cm length[19]. Exclusive breastfeeding is recommended due to its unique nutrients composition best suited for the baby. Nutrients supplied by mother's milk are considered adequate for the optimal growth and development of infants. For a particular nutrient, the average intake of full-term infants born to healthy and well-nourished mothers and are exclusively breastfed has been adopted as the primary basis for deriving the Adequate Intake (AI) for most nutrients during the first 6 months of life. Energy is required for basal metabolism, growth and physical activity which are highest during the first six months starting from 113 kcal/kg/day at birth to 81 kcal/kg/day at 6 months for boys and 107 kcal/kg/day at birth to 82 kcal/kg/day at 6 months for girls[97]. Similarly, protein and other nutrients demand per kg body weight are highest during this period to meet the physiological needs and growth of the body.

Infants and young children (6-24 months)

During the second half of infancy and onwards, growth velocity becomes relatively slower with increasing age. Children during this period on average gain about 4 kg body weight and 20 cm height, therefore require adequate amounts of breast milk and complementary foods to meet the body needs for optimal growth and development[19]. Energy requirements of this age group have been estimated between 80-82 kcal/kg/day for girls and boys, respectively[97]. Protein requirements during the first and second years of life have been estimated as 1.69 g and 1.25 g/kg/day, respectively[98]. WHO recommends that complementary foods should be introduced at 6 months of age in addition to breast milk, initially 2-3 times a day for infants from 6-8

months, increasing to 3-4 times daily for infants 9-11 months and 3-4 times complementary foods plus additional nutritious snacks 1-2 times/day for 12-24 month-old children[99]. In terms of energy requirements from complementary feeding during different time periods, it is recommended that complementary foods should provide 200 Kcal/day to 6-8 month-old infants, 300 kcal/day to 9-11 month-old infants and 550 kcal/day to 12-23 month-old children in addition to breast milk[100]. Continue frequent, on demand breast feeding until 2 years of age or beyond, the IYCF recommendations proposed by UNICEF/WHO[14,17] are given as Annexure-V. For further details, Pakistan Infant and Young Child Strategy, 2016-20 can be consulted[101].

Children (2-3 years)

Children at this age group grow, learn and acquire skills, enjoy greater mental and motor skills, and are actively engaged in eating and playing. It is a period of learning, talking, communicating, feelings and emotional development. Children by this age begin to explore life independently. It is a time when children learn, develop and display variations in eating behaviour, skills, knowledge and attitude relating to food. Energy requirements for children at this age group are about 80 kcal/kg/day[97] while protein requirement is estimated at 1.1g/kg/day with an acceptable macronutrient distribution range for protein between 5%-20% of total energy[102]. Depending on age, size, sex and physical activity total energy requirements of children in this age group range between 1000-1400 kcal/day[103].

Children (3-10 years)

Growth and development of children 3-10 years continue at a moderate pace but there is a continuous demand for nutrients to meet the body needs. In general, children gain about 2-2.5 kg body weight/year and 5-6cm height/year[98]. Mean body weight and length of boys is generally greater than their corresponding age girls. Energy requirements for boys and girls are estimated at 80 kcal/kg/day and 77kcal/kg/day at age 3 but decreased to 67kcal/kg/day and 61 kcal/kg/day at age 10 for boys and girls, respectively[97]. Recommended protein requirements for children are estimated at 1.2 g/kg/day[98].

Adolescents (10-19 years)

Adolescence period is accompanied by increased physiological changes with rapid physical growth and development that require increased amounts of nutrients to fulfil the body needs. At puberty and at peak weight and height accretion, adolescents gain about 3-5 kg/year weight and 6-7 cm/year height, respectively[104]. After the age of 17 years, weight and height gain of adolescents reduces substantially to 1.5-2kg/year and 0.5-1cm/year, respectively. Adolescents by and large attain 50% of final adult weight and 20% of adult height for which optimal nutrition is essential[105]. Energy requirements for adolescent boys and girls are estimated at 55-65 kcal/kg/day and 45-60 kcal/kg/day, respectively. Recommended protein requirements for adolescents are 1.1-1.2 g/kg/day[98].

Adults (19-60 years)

In adults (age 19 and above), physical growth and development almost come to an end except skeletal growth that continues with an increase in bone mass till the age of 30-35 years. Beyond this period, bone resorption dominates over bone formation process and thus there is a loss of calcium hydroxyapatite from bones and teeth with an increased risk of bone related diseases and fractures. Mean energy expenditure decreases and so does the nutritional requirements. For adults with 60 kg body weight a basal metabolic rate (BMR) of 1515 and sedentary, moderate to heavy or vigorous levels of physical activity, the estimated energy requirements are 2318, 2727 and 3485 kcal/day while for women with 55 kg body weight a BMR of 1241 and sedentary, moderate to heavy or vigorous levels of physical activity, the estimated energy requirements are 1899, 2234 and 2854 kcal/day. Recommended protein requirements for adults are 1 g/kg/day[98].

Elderly (>60 years)

Nutritional requirements of the elderly vary due to their varying health status. An age related decline in physiological functions combined with the prevalence of chronic diseases and limited health care make the elderly more vulnerable to nutritional deficiencies. More individualized attention is required at this stage to provide the elderly with adequate dietary and nutritional supplements to improve their nutritional well-being.

Pregnancy

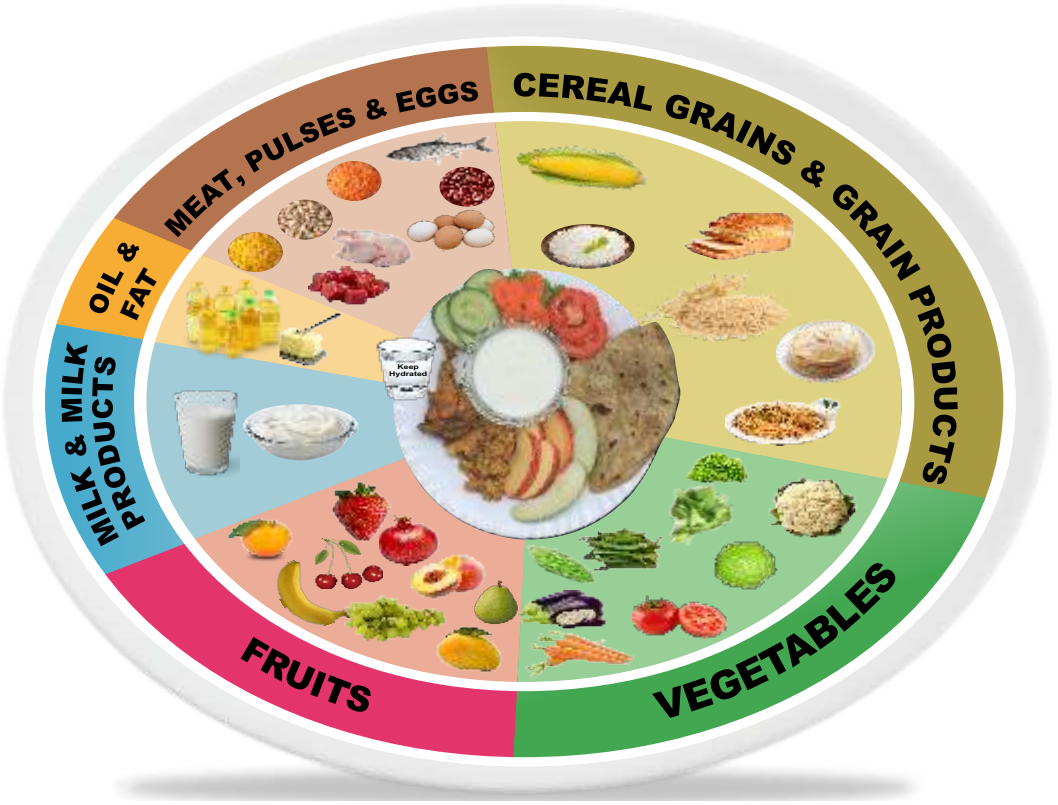
Additional nutrients requirements for pregnancy are based on the amount of tissue deposits, fat accumulation and an increase in blood volume. Based on the growth and development of the fetus, nutrient requirements vary in three trimesters, minimum additional nutrients requirements during the first trimester, moderate in the second trimester and highest in the third trimester. The total cost of energy during pregnancy is estimated at around 80,000 kcal, which comes to 300 kcal per day[106]. The RDAs for additional energy and protein intakes during the second and third trimesters are 300 kcal/day, 7 g/day and 23 g/day,respectively[106].Optimum weight gain during pregnancy is marker of birth weight; both under and overweight gains during pregnancy are associated with pregnancy complications and adverse pregnancy outcomes. For overweight and obese women- lesser gestational weight gain (<12 kg), for normal- moderate weight gain (12 kg) and for underweight- greater weight gain (12-14 kg) is recommended[98].

Lactation

Lactation imposes additional nutrients demand on women to meet the requirements of breastfeeding. It has generally been agreed that the nutrients cost incurred on breast feeding shall be met through dietary sources so that the nutritional well-being of women and children could be protected to reduce the risk of malnutrition, morbidity and mortality in both groups. Additional energy and protein recommendations for lactating women during the first six months of lactation are 600 kcal/day and 19 g/day, respectively, while for the following six months, the additional energy and protein recommendations are 520 Kcal/day and 13 g/day respectively[98].

MY PLATE

There is no single food that provides all the essential nutrients to the body in adequate amounts for growth and development of human beyond six months of age. Foods are divided into five basic groups: (i) Cereal grains and grain products (ii) Meat, pulses and eggs (iii) Milk and milk products (iv) Vegetables (v) Fruits. Oil and Fat are included in the plate, as they constitute an integral component of traditional Pakistani diet. These groups are presented in "My Plate" form to reinforce that the diet must contain all food groups to satisfy the nutritional requirements of the body.



Cereal grains and grain products group is essential for providing carbohydrates, protein, vitamins (thiamine), vitamin E and minerals. It is the main staple food providing over 50% of energy, protein, vitamins and mineral requirements of the body. The acceptable macronutrient distribution range (AMDR) from carbohydrates in the form of total calories is 45-65% for different age groups[107].

Meat and pulses group includes mutton, beef, poultry, fish, liver, eggs and pulses that are rich sources of proteins and minerals. The AMDR from protein in the form of total calories is 10-35% for different age groups and 20-35% from fat for adults. Acceptable rang for childen are similarto those of adults accept that infats and younger children need a slightly higher proportion of fat (25-40%) [107].

Dairy group includes milk and milk products essential for skeletal growth and development, neurological and muscular functions. It is a rich source of calcium, phosphorous, protein, lactose, minerals and vitamins. Vegetables are essential for providing antioxidants, dietary fibre, vitamins and minerals that protect body

against chronic diseases, and for regular body metabolism. Increase consumption of vegetables is recommended to meet the nutritional requirements, maintain desirable body weight, metabolic functions and prevent the incidence of chronic diseases.

Fruits are essential not only for providing vitamins and minerals but also for supplying phytochemicals and dietary fibre for optimal metabolic functions, growth and development. Fat, oil, salt and sugar may be used moderately to reduce the risk of overweight, obesity, hypertension, cardiovascular diseases, and diabetes.

Serving size and frequency of servings

Since nutritional requirement varies by age and gender, emphasis is laid on the development of PDGN by various age groups and gender. For the purpose of PDGN, the population is divided into following age groups:

- Infants (0-6 months)
- Infant and young children (6-24 months)
- Children (2-3 years)
- Children (3-10 years)
- Adolescents (10-19 years)
- Adults (19-60 years)
- Elderly (>60 years)
- Pregnant women
- Lactating mothers

Infants (0-6 months)

It has been well established that breast milk is a complete food for the first six months of life and provides all the essential nutrients in balanced amount to the baby for meeting its physiological requirements, optimal growth and development. Exclusive breastfeeding means the infant is given only breast milk (no other liquid or food). Mothers should be encouraged, educated and facilitated to practice exclusive breastfeeding for the baby in the first six months. Exclusive breastfeeding offer many benefits for the infant and mother, important source of energy and nutrients, and protects against gastrointestinal infections. Breast milk is especially critical source of energy and nutrients during illness and reduces mortality among children who are malnourished[109].

Recommendations for infants (0-6 months)

- Practice exclusive breastfeeding from 0 – 6 months
- Try to start breastfeeding within an hour of your baby's birth
- Avoid prelacteal feeds and bottle feeding
- Do not start complementary feeding until the baby is 6 months old

Infants and young children (6-24 months)

The period between 6-24 months is crucial for laying a strong nutrition base to meet the demands of accelerated growth and development, and to prevent growth faltering, children morbidity and mortality. Exclusive breastfeeding alone is unable to meet the nutritional requirements of infants beyond six months of age. To complement the baby's nutrients requirements, introduction of soft nutrients dense foods (thick cereals porridge, kheer, khichri, egg, banana), soups (chicken vegetables, meat, corn) and fresh fruit or fruit juice in small amounts with a gradual increase, along with breastfeeding is vital for child's growth and development. It shall be continued till two years of age after which a gradual shift to the family food is advised.

It is also important that complementary foods must be safe, age-appropriate and consists of a variety of foods to provide adequate amount of nutrients to the body. The consistency of complementary foods should change from semi-solid to solid as the infants grow. Fortified complementary foods may be given when availability of local diversified food becomes an issue.

It has been recommended that infants aged 6-8 months should receive complementary foods 2-3 times/day, infants aged 9-11 months should receive complementary foods 3-4 times/day and additional nutritious snacks 1-2 times/day for children older than 1 year[99]. The estimated energy requirements of complementary foods for infants between 6-8 months are 200 kcal/day; 300 kcal/day for 9-11 months and 550 kcal/day for 12-24 months old children[100].

Dietary recommendations for infants and young children (6-24 months)

- Introduce complementary food at 6 months of age while continuing breastfeeding.
- Increase food consistency and variety gradually as a child gets older.
- Increase the number of times that the child is fed complementary foods, as a child gets older.
- Ensure complementary foods are adequate in quality and quantity; 2-4 times/day from a variety of foods, starting from semi-solid to solid foods gradually suitable for young children under 2 years of age, e.g., eggs, cereals, fruits and vegetables, dairy products, meats and pulses.
- Salt and sugar should not be added to complementary foods[110]
- Provide nutrients dense snacks from fresh foods (1-2 times/day) as per child's appetite and requirement.
- Practice good hygiene and proper food handling. Store food safely and serve food immediately after preparation. Use clean utensils for preparation, serving and feeding children. Avoid the use of bottles, which are difficult to clean.
- Increase liquid intake during illness, including more frequent breastfeeding. Encourage child to eat

The amount of iron absorbed from plant foods e.g. cereals, legumes, vegetables and fruits are increased by eating at the same meal a) foods rich in vitamin C (lemon) b) animal/poultry meat and organs c) fish and other seafood. Serve citrus fruits with iron and protein rich foods to increase iron absorption. Eating

fermented cereals increases iron absorption. Vitamin A rich vegetables and fruits should be consumed daily. Provide diets with adequate fat content (use vitamin A and D fortified oil). Consuming black tea, coffee and soft drinks decrease iron absorption. Therefore avoid giving drinks with low nutrient value such as tea, coffee and sugary drinks such as soda and artificial juices. Biscuits, rusks are not a good source of nutrients and should not be given as the main meal[98]. Some of the commonly consumed complementary foods given in the Food Composition Table for Pakistan[95] are reproduced as Annexure-VI.

Children (2-3 years)

Children in this age group require a well-balanced, nutrient dense diet to meet the nutritional requirements of the body needed for maintenance of basal metabolic rate, optimal physical and mental growth and development, and increased levels of physical activity. The parents and caregiver must help children in establishing healthy dietary habits, good hygiene practices, and healthy behaviour and lifestyle attitudes for an improved and productive life. The basic principle of meal planning should be adopted and the diet must be inclusive of variety of foods, which are quantitatively and qualitatively sufficient to meet growth and development needs of the body.

Food and serving size for children (2-3 Years)

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	2	1 serving=1 cup of milk or 1 cup of yogurt or 1 slice of cheese, kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk. 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	1-2	1 serving= 1 chapatti* or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup), sweet potato (1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories
Vegetables	1-2	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad. One serving of vegetables will provide 5 g carbohydrates, 2 g protein, and 25 calories.
Fruits	1-2	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15g carbohydrates and 60 calories.
Meat, pulses and eggs	1-2	1 serving of meat (28 g, 1 ounce lean meat= 1-2 small pieces of meat or 1-2 pieces of fish) or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories. calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

*1 regular Chapatti is made from 60 g of flour and baked chapatti weighs 80.g. It provides approx. 160 kcal which is equal to two slices of bread, so serving size refer to chapatti as its commonly consumed as staple diet in Pakistan

Salt, Sugar and Oil

- Use a minimum amount of salt and sugars in cooking. Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk and refined foods, sweets, soft drinks, French fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits thoroughly and protect foods from the presence of residues of flies, pathogens, dirt; cover properly and refrigerate them at 5°C or below.

Children (3-10 years)

Growth and development in children between 3-10 years of age, get slower than infancy and is considered a period of catch-up growth to bridge the nutritional deficiencies and build up the deficient body nutritional stores. It is an opportune time to improve nutritional status and to boost body's immune system for fighting against infections and diseases. Children at this age develop better taste acuity, improved digestive and absorptive capacities, enhanced enzymes and hormonal secretion, coordination and control to digest, absorb and utilize family foods. This period is also important for learning and acquiring skills and developing habits for eating (adult type) family foods. At this stage a child picks and imitates what their peers and older people eat and drink. Encouraging children to adopt healthy eating practices pay dividends to rest of their life. Children who eat nutritious breakfasts improve their school performance and are tardy or absent significantly less often than their peers who do not. A nutritious breakfast is a central feature of a diet that meets the needs of children and supports their healthy growth and development.

Introducing a variety of nutrients dense foods that comprise of milk and milk products, meat and meat products, vegetables and fruits, cereals and pulses and increasing meal frequencies will enable children not only to meet their daily nutritional requirements but also to replenish the nutrient stores of the body.

Food and serving size for children (3-10 years)

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	2-3	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk. 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	3-5	1 serving= 1 chapatti* or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables:** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup), sweet potato (1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories
Vegetables	1-2	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad. One serving of vegetables will provide 5 g carbohydrates, 2 g protein, and 25 calories.
Fruits	1-2	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	3-4	1 serving of meat (28 g, 1 ounce lean meat= 1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

*1 regular Chapatti is made from 60 g of flour and baked chapatti weighs 80g

Salt, Sugar and Oil

- Use a minimum amount of salt and sugars in cooking. Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk and refined foods, sweets, soft drinks, French fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits thoroughly and protect foods from the presence of residues of flies, pathogens, dirt; cover properly and refrigerate them at 5°C or below for a day only.

Adolescents (10-19 years)

Adolescence is a period of rapid growth and development marked by rapid changes in body size, shape, and composition that require adequate nutrition for attaining desirable weight, height, replenish nutrient stores to reach full genetic potential in physical, mental and scholastic performance. The rapid growth is accompanied by physiological changes that include increased hormonal secretions and reproductive development with secondary characteristics, cell proliferation and increased blood volume, which increases the nutrient requirements. At the peak of the adolescent growth spurt, the nutritional requirements may be twice as high as those of the remaining period of adolescence[111].

During adolescence, weight and height increase by about 50% and 20% of adult weight and height respectively, that puts greater demand of nutrients which could be only met through consumption of nutrients dense diversified foods[28]. However, girls' marriage during adolescence followed by subsequent pregnancies and lactation results in additional nutritional stress on women making them vulnerable to nutritional deficiencies with increased risk of morbidity, neonatal and maternal mortalities.

Good and adequate nutrition during adolescence is pre-requisite for health, productivity and economic outputs. Adolescent girls need special attention with regard to nutritional wellbeing because of their multi-dimensional responsibilities at home and outdoors including bringing water, collecting firewood, and helping mothers at home in domestic chores. Failing to cope with increasing nutrient demand, many adolescents remain underweight and stunted which may be a cause of obstetric complications and adverse pregnancy outcomes[112].

The vicious cycle of malnutrition perpetuates from generation to generation with increased prevalence of diseases, overburden on health systems and substantial social and economic losses for the country. Nutrition during all stages of life but particularly during adolescence period is crucial and cost effective as the amount spent on foods is negligible to costs incurred on treatments and sufferings caused by diseases, disabilities, loss of work and premature deaths in later life.

Food and serving size for adolescents (10-19 years)

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	3-4	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk. 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	5-6	1 serving= 1 chapatti or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal.
Vegetables	2-3	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad. One serving of vegetables will provide 5 g carbohydrates, 2 g protein, and 25 calories.
Fruits	2-3	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	2-3	1 serving of meat (28 g lean meat=1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

Salt, Sugar and Oil

- Use a minimum amount of salt and sugars in cooking. Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk, refined foods, sweets, soft drinks, French fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits and protect food from flies, pathogens, dirt; cover and refrigerate them at 5°C or below for a day only.

Adult (19-60 years)

Adulthood is a period where growth and development to a large extent cease, however, skeletal development and deposition of calcium, phosphorus and magnesium in bones continues till the age of 30-35 years. Beyond this age, bone resorption predominates over bone formation and the time taken to deplete skeletal mineral deposits is proportional to the amount of mineral deposits, the higher are the mineral deposits during skeletal growth and development, the greater would be the time required to erode

mineral deposits from bones. Dietary reference Intakes (DRIs): Recommended dietary allowances, adequate intakes for macro and micronutrients vary with age i.e. 19-30 years, 31-50 years, 51-70 years, and >70 years (Annexure IV).

Good and adequate nutrition in combination with regular aerobic exercise and physical activities are essential throughout adulthood period to maintain optimum nutritional status, prevent nutritional deficiencies, overweight and obesity which are the leading causes of non-communicable diseases including diabetes, hypertension, cardiovascular diseases and cancers. In recent years, the prevalence of overweight and obesity in adults has been increasing in an unprecedented manner resulting in increased morbidity and mortality. Dietary modifications including reduction of sugars, salt, saturated fats, trans-fatty acids, physical activity and healthy lifestyles are cost-effective interventions essential to reduce and control adulthood morbidities and mortalities.

Food and serving size for adults (19-60 years)

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	2-3	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk. 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	4-5	1 serving= 1 chapatti* or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables:** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup), sweet potato (1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories
Vegetables	2-3	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad). One serving of vegetables will provide 5 g carbohydrates, 2 g protein and 25 calories.
Fruits	2-3	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	2-3	1 serving of meat (28 g lean meat=1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

Salt, Sugar and Oil

- Use a minimum amount of salt, sugars and less oil in cooking Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk, refined foods, sweets, soft drinks, French fries, samosa ,and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits and protect foods from the presence of residues of flies, pathogens, dirt; cover properly and refrigerate them at 5°C or below for a day only.

Elderly (>60 years)

Older people have special dietary and health care needs to meet the body nutrients requirements, boost their immune systems and maintain optimum level of physical activity to prevent the advancement of diseases and complications that may increase the risk of falling, bone fractures and immobility. Diet adequate both in quality and quantity is vital for nutrition wellbeing and prevent the incidence and severity of diseases. Eating healthy, combined with regular physical activity, can help a person live a full and active life, preserving independence in older age.

Elderly need to enhance dietary and health care to ward off non-communicable and degenerative diseases owing to age and compromised nutrition and health status. Impaired taste acuity, gastrointestinal, enzymatic, hormonal and metabolic functions in older persons make them more vulnerable to malnutrition and diseases. Dietary diversification (including fruits, vegetables, milk, yogurt, fish etc.) as well as dietary modification, is essential to provide an adequate amount of dietary fibre, proteins, vitamins, minerals, water and fluid to prevent constipation and other age-related diseases.

Food and serving size for elderly (>60 years)

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	2-3	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk). 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	4-5	1 serving= 1 chapatti* or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup) or sweet potato (1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories
Vegetables	2-3	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad). One serving of vegetables will provide 5 g carbohydrates, 2 g protein and 25 calories.
Fruits	2-3	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	2-3	1 serving of meat (28 g lean meat=1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

Salt, Sugar and Oil

- Use a minimum amount of salt, sugars and less oil in cooking. Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk, refined foods, sweets, soft drinks, French fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits and protect food from the presence of residues of flies, pathogens, dirt; cover properly and refrigerate them at 5°C or below for a day only.

Pregnant women

Good nutrition during pregnancy is not only essential for maintaining maternal nutritional and health status but also for growth and development of foetus. Adequate and a better quality diet during pregnancy is vital for meeting the physiological requirements of expanding maternal tissues and blood volume as well as growth and development of foetus to avoid unfavourable pregnancy outcomes.

Poor nutritional status during pregnancy leads to poor intrauterine growth and development with increased risk of small for gestational age babies, low birth weight babies with impaired physiological functions, increased morbidity and neonatal mortality.

Improving maternal nutrition through improved dietary diversification and nutritional supplements appears to be one of the most profitable investments in paying long term dividends by reducing health problems, medical costs and increasing productivity and economic outputs. Nutritional requirements of pregnant women depend on the pre-pregnancy nutritional status, the poor the nutritional status prior to conception the higher are the recommended nutrients intakes and weight gain during pregnancy. Pre-pregnancy weight and weight gain during pregnancy have been associated with the birth weight of the baby. Both low and high weight gains result in adverse pregnancy outcomes[98]. Since first trimester is limited mostly to embryonic and cell differentiation with nominal weight gain (1-2 kg), additional calorie intake is recommended from second trimester onwards to avoid undesirable maternal weight gain and pregnancy complications. Twelve to sixteen kilograms weight gain is recommended for women with normal body mass index at conception and higher weight gain for women with lower body mass index and lower weight gain for overweight and obese women is recommended; due to increased growth and development, additional 300 kilocalories, 10 g protein, 15 mg iron, 220 µg folate, 400 mg calcium, 400 mg phosphorus per day is recommended for pregnant women[106].

Food and serving size for pregnant women

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	2-3	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk). 1 cup of whole milk will provide 15 g carbohydrates, 8 g protein, 8 g fat and 160 calories.
Cereal grains and grains products	5-6	1 serving= 1 chapatti* or 2 slices of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup) or sweet potato (1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories.
Vegetables	2-3	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad). One serving of vegetables will provide 5 g carbohydrates, 2 g protein and 25 calories.
Fruits	2-3	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	2-3	1 serving of meat (28 g lean meat=1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

Salt, Sugar and Oil

- Use a minimum amount of salt, sugars and less oil in cooking, use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk, refined foods, sweets, soft drinks, french fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits and protect food from flies, pathogens, dirt; cover and refrigerate them at 5 °C or below for a day only.

Lactating women

Lactation is a period where nutritional requirements of women are increased due to breast feeding of the new born baby. It has been estimated that mothers during the first six months secrete 750 ml milk/day, which drops to 600 ml milk/day in the second six months of the postnatal period providing about 525 kcal/day and 420kcal/day,respectively[44]. To compensate the energy and micronutrients transferred from the mother to infant through breastfeeding and also to enhance the quality of milk and supply, additional 500 kcal, 12-15 g protein, along with optimal amount of micronutrients (vitamin A, vitamin C, vitamin B1, vitamin B2, niacin, vitamin B6, vitamin B12, calcium, vitamin D, phosphorus, zinc, iodine and selenium) per day are recommended[44]. The lactating women need special attention also to rest well in addition consuming a healthy diet, which can help in maintaining good supply of milk as well.

Food and serving size for lactating women

Food Group	No. of Servings /day	Serving size and description
Milk and milk products	3-4	1 serving=1cup of milk or 1 cup of yogurt or 1 slice of cheese or 1 cup of kheer or feerni or other milk-based products equivalent to nutrients supplied by 1 cup of milk). 1 cup of whole milk will provide 15 g carbohydrates, 8-g protein, 8 g fat and 160 calories.
Cereal grains and grains products	5-6	1 serving= 1 chapatti or 2 slice of bread (toast) or 2/3 cup of cooked rice or 1 cup of cereals equivalent to nutrients supplied by 2 slices of bread. One serving of chapatti or 2 slices of bread (2 toast x 28 g=56 g) will provide 30 g carbohydrates, 6 g protein, 0-2 g fat and 160 Kcal. **Starchy Vegetables** 1 potato (100 g) or corn (1/2 cup), peas (1/2cup) pumpkin (1cup), sweet potato(1/2cup) will provide 15 g carbohydrates, 3 g protein, 0-1 g fat and 80 calories
Vegetables	2-3	1 serving= ½ cup of cooked non-starchy vegetables or ½ cup of vegetables juice/soup or 1 cup of fresh vegetables/salad). One serving of vegetables will provide 5 g carbohydrates, 2 g protein, and 25 calories.
Fruits	2-3	1 serving=1 small size banana or 1 apple or 1 peach or 2-3 plums or 3-4 apricots. Each serving will provide 15 g carbohydrates and 60 calories.
Meat, pulses and eggs	2-3	1 serving of meat (28 g lean meat=1-2 small pieces of meat or 1-2 pieces of fish or 1 egg, or ½ cup of cooked pulses). One serving of lean meat will provide 7 g protein, 3 g fat and 55 calories. One serving of meat with medium fat will provide 7 g protein, 5 g fat and 75 calories. One serving of meat with high fat will provide 7 g protein, 8 g fat and 100 calories.

**1 regular Chapatti is made from 60 g of flour and cooked chapatti weighs 80g

Salt, Sugar and Oil

- Use a minimum amount of salt and sugars and less oil in cooking. Use less than 5 g salt/day, less than 10% calories from free sugars and less than 10% of total fat calories from saturated fat.
- Avoid junk, refined foods, sweets, soft drinks, French fries, samosa, and other deep-fried foods.

Food Safety & Hygiene

Use clean water for washing vegetables and fruits and protect food from presence or residues of flies, pathogens, dirt; cover properly and refrigerate them at 5°C or below for a day only.

An inclusive table indicating number of servings of five food groups for different age and physiological groups is attached as Annexure VII.

SAMPLE MENUS BY AGE AND PHYSIOLOGICAL STATUS

Sample menu for children (3-10 years)

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Chapatti/paratha/toast/cereals*	1-2 toast or ½-1 chapatti or ¼-½ paratha or ½-1 cup cereals	80-160	3-6
	Cooked egg ‡	1 medium	90	6
	Milk†	½ cup	80	4
Snack	Banana or any other seasonal fruit ¶	One medium	80	-------
	Shami kabab‡	1	90	6
Lunch	Dal§	½-1 plate	70-140	4-8
	Roti*	½-1 chapatti	80-160	3-6
	Yogurt†	½ cup	80	4
	Salad§	½-1 bowl	13-25	---------
Snack	Apple or any other seasonal fruit	1 medium	80	---------
	Peanuts**	30 g	160	7
Dinner	Chicken or meat curry of pulses ‡	1 plate	140	8
	Roti	½- 1 chapatti	80-160	3-6
	Salad§	½-1 bowl	13-25	-----
	Apple or any other seasonal fruit¶	1 medium	80	-----
	Milk/Kheer†	½ cup	80	4
		Total	1296-1630	52-65

*Chapatti or paratha or toast or fortified cereals providing a similar amount of calories and proteins;

‡ Cooked egg or meat, chicken, fish or lentil or chickpea or red beans or shami kabab or any other meat based protein and pulses providing a similar amount of calories and proteins;

¶Banana or apple or any other seasonal fruit providing a similar amount of calories;

§Chicken curry or dal or meat curry or beans providing a similar amount of calories and proteins;

† ½ cup milk or ½ cup yogurt or ½ slice cheese or any other milk-based product providing a similar amount of calories and proteins;

** Peanuts or any other nuts providing a similar amount of calories and proteins

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Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables (½ cup or 125 g cooked food); ½bowl fresh salad= (½cup or 125 g); 1 serving peanuts=30g peanuts

Sample menu for adolescents (10-19 years)

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Milk†	1 cup	160	8
	Cooked egg ‡	1 medium	90	6
	Roti/toast/cereals*	½-1 chapatti	80-160	3-6
Snack	Apple or any other seasonal fruit¶	1 medium	80	----------
	Potato cutlet§	1-2	49-98	1-2
Lunch	Lentil‡	½ plate	70	4
	Roti	1-2 chapatti	160-320	6-12
	Yogurt†	½ cup	80	4
	Salad§	½-1 bowl	13-25	-----
Snack	Banana¶ or any other seasonal fruit	1 medium	80	----
	Peanuts**	30 g	160	7
Dinner	Chicken or meat curry or pulses ‡	1 plate	140	8
	Roti	1-2 chapatti	160-320	6-12
	Salad§	½-1 bowl	13-25	-----
	Raita†	½-1 cup	80-160	4-8
	Guava or any other seasonal fruit¶	1 medium	80	----------
Snack	Carrot halwa†	1 cup	250	8
		Total	1745-2298 Kcal	65-85 g

† 1 cup milk or 1 cup kheer or 1 cup yogurt or 1 slice cheese or any other milk-based product providing a similar amount of calories and proteins; 1 cup kheer will provide additional calories, so they should be consumed occasionally;

‡ Cooked egg or meat, chicken, fish or lentil or chickpea or red beans or shamikabab or any other meat based curry providing a similar amount of calories and proteins;

*1-2 toast or ½-1 chapatti or ½-1 cup cereals or ¼-1/2 paratha or any other cereal providing a similar amount of calories and proteins;

¶ Banana or any other seasonal fruit providing a similar amount of calories; §Potato cutlet or starchy vegetables providing a similar amount of calories and proteins;

‡Aloo ghost or chicken curry or any other curry or pulses providing a similar amount of calories and proteins;

†Carrot-kheer or pumpkin kheer or any other milk-based dessert providing a similar amount of calories and proteins;

** Peanuts or any other nuts providing a similar amount of calories and proteins;

Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables (100 g cooked food); 1 bowl fresh salad= (1 cup or 250 g);

1 serving peanuts=30g peanuts

Sample menu for adults (19-60 years)

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Roti/toast/cereals*	1-2 chapatti	160-320	6-12
	Rooked egg ‡	1 medium	90	6
	Apple or any other seasonal fruit¶	1 medium	80	----------
	Milk†	1 cup	160	8
Snack	Shami sandwich‡‡	1	180	8
Lunch	Spinach and potato curry§	1 plate	109	3
	Roti	2 chapatti	320	12
	Yogurt†	½ cup	80	4
	Salad§	1 bowl	25	---------
Snack	Banana or any other seasonal fruit	1 medium	80	---------
Dinner	Pulao**	1 plate	250	7
	Fish ‡	100 g	140	8
	Salad§	½-1 bowl	13-25	--------
	Raita†	½-1 cup	80-160	4-8
	Apple ¶	1 medium	80	--------
Snack	Peanuts***	30 g	160	7
	Kheer†	1 cup	160	8
		Total	2167-2419 Kcal	8191 g

*1 roti or 2 toast or ½ paratha or 1 cup fortified cereals providing a similar amount of calories and proteins;

‡ Cooked egg or meat, chicken, fish or lentil or chickpea or red beans or shami kabab;

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† 1 cup milk or 1 cup kheer or 1 cup yogurt or 1 slice cheese or any other milk-based product providing a similar amount of calories and proteins;

¶ Banana or apple or any other seasonal fruit providing a similar amount of calories;

‡‡ Shami sandwich or egg sandwich, or chicken sandwich or any other meat or pulses based food providing the similar amount of calories and proteins;

§Spinach and potato curry or any other vegetable curry providing a similar amount of calories and proteins

** Pulao or dal-roti or vegetable roti providing a similar amount of calories and proteins;

*** Peanuts or any other nuts providing a similar amount of calories and proteins

Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables (100 g cooked food); 1 bowl fresh salad= (1 cip or 250 g);

1 serving peanuts=30g peanuts

Sample menu for elderly (> 60 years)

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Cereals/chapatti/toast*	1 cup/1 chapatti/2 toast	160	6
	Milk†	1 cup	160	8
	Cooked egg‡	1 medium	90	6
	Banana or any seasonal fruit or juice¶	1 medium/1 cup	80	-------
Snack	Egg sandwich/ chicken sandwich/ or shami sandwich‡†	1	180	8
Lunch	Spinach curry§	½ plate	109	3
	Roti*	2 chapatti	320	12
	Salad±	1 bowl	25	---------
	Yogurt†	1 cup	160	8
Snack	Shami kabab#	1	90	6
	Banana or any other seasonal fruit¶	1 medium/1 cup	80	----------
Dinner	Vegetable rice***	1 plate	187	4
	Dal**	1 plate	140	8
	Salad±	1 /2 bowl	13	----
	Raita/yogurt†	1 cup	160	8
	Milk/Kheer/dessert†	1 cup	160	8
		Total	2114 Kcal	85 g

*1 cup fortified cereals or 1 roti or 2 toast or ½ paratha providing a similar amount of calories and proteins;

†1 cup milk or 1 cup yogurt or 1 cup kheer or any other milk-based product providing a similar amount of calories and proteins;

‡ Cooked egg or matar keema or meat, chicken, fish or lentil or chickpea or red beans or any other pulses providing a similar amount of calories and proteins;

¶ Banana or any other seasonal fruit providing a similar amount of calories;

‡‡Egg sandwich or chicken sandwich or shami sandwich or boiled chickpea or red beans providing a similar amount of calories and proteins;

§Spinach curry or any other vegetable providing a similar amount of calories and protein;

Shami kabab or red beans or boiled gram or meat based snack providing a similar amount of calories and proteins;

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** Dal or meat curry providing a similar amount of calories and protein;

± Salad or any other leafy vegetables providing a similar amount of calories;

*** Vegetable rice or bread with salad providing a similar amount of calories and protein;

Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables = (1/2cup or 125 g cooked food); 1 bowl fresh salad= (1 cup or 250g) ;

1 serving peanuts=30g peanuts

Sample menu for pregnant women

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Roti/toast/cereals*	1 chapatti	160	6
	Cooked egg‡	1 medium	90	6
	Milk¶	1 cup	160	8
Snack	Beans or gram boiled†‡	1 cup	220	10
	Guava¶	1 medium	80	------
Lunch	Meat ball or kofta curry‡‡‡	1 plate	268	10
	Roti*	2 chapatti	320	12
	Yogurt†	½ cup	80	4
	Salad§	1 bowl	25	----------
Snack	Shami sandwich‡‡	1-2	180-360	8-16
Dinner	Vegetable rice**	1 plate	187	4
	Dal chana‡	1 plate	140	8
	Salad§	1 bowl	25	----------
	Apple ¶	1 medium	80	----------
Snack	Peanuts***	30 g	160	7
	Carrot halwa****	1 cup	250	6
	Milk†	1 cup	160	8
		Total	2585-2765 Kcal	97-105 g

*1 roti or 2 toast or ½ paratha or 1 cup fortified cereals providing a similar amount of calories and proteins;

‡ Cooked egg or matar keema or meat, chicken, fish or lentil or chickpea or red beans or any other pulses providing a similar amount of calories and proteins;

† 1 cup milk or 1 cup yogurt or 1 cup kheer or any other milk-based product providing a similar amount of calories and proteins;

¶ Any seasonal fruit providing a similar amount of calories;

‡‡ Chicken sandwich or shami sandwich or egg sandwich or boiled chickpea or red beans or slice of pizza or peanut butter sandwich providing a similar amount of calories and proteins;

‡‡‡ Meat or kofta curry or pulses providing a similar amount of calories and protein;

** Vegetable rice or bread with salad providing a similar amount of calories and protein;

§Mix vegetable curry or salad or any other vegetable providing a similar amount of calories and protein;

*** Peanuts or any other nuts providing a similar amount of calories and proteins

**** Carrot-kheer or pumpkin kheer or any other milk-based dessert providing a similar amount of calories and proteins

Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables = (½ cup or 125 g cooked food); 1 bowl fresh salad= (1cup or 250 g);

1 serving peanuts=30g peanuts

Sample menu for lactating women

Time	Food	Serving Size	Calories (Kcal)	Protein (g)
Breakfast	Roti/toast/cereals*	1 chapatti	160	6
	Cooked egg‡	1 medium	90	6
	Milk¶	1 cup	160	8
Snack	Chicken sandwich‡	1	180	8
	Apple or any other seasonal fruit ¶	1 medium	80	----------
Lunch	Aloo qeema‡	1 plate	222	11
	Roti *	2 chapatti	320	12
	Yogurt†	1 cup	160	8
	Salad§	1 bowl	25	----------
Snack	Shami kabab#	1-2	90-180	6-12
Dinner	Vegetable rice**	1 plate	187	4
	Dal masoor	1 plate	140	8
	Salad §	1 bowl	25	----------
	Raita	1 cup	160	8
	Banana¶	1 medium	80	----------
Snack	Peanuts §§	30 g	160	7
	Carrot halwa***	1 cup	250	6
	Milk†	1 cup	160	8
		Total	2609-2699 Kcal	106-112 g

*1 roti or 2 toast or ½ paratha or 1 cup fortified cereals providing a similar amount of calories and proteins; ‡ Cooked egg or meat, chicken, fish or lentil or chickpea or red beans or any other pulses providing a similar amount of calories and proteins;

† 1 cup milk or 1 cup yogurt or 1 cup kheer or any other milk-based product providing a similar amount of calories and proteins;

¶Apple or banana or any other seasonal fruit providing a similar amount of calories;

‡‡ Chicken sandwich or shami sandwich or egg sandwich or boiled chickpea or red beans or peanut butter sandwich providing a similar amount of calories and proteins;

Shami kabab or red beans or boiled gram or meat based snack providing a similar amount of calories and proteins;

‡ Aloo qeema or mater qeema or beef curry or any other meat-based curry or beans or any other pulses providing a similar amount of calories and proteins;

**Vegetable rice or bread with salad providing a similar amount of calories and protein;

*** Carrot-kheer or pumpkin kheer or any other milk-based dessert providing a similar amount of calories and proteins;

§Salad or mix vegetable or any other vegetable providing a similar amount of calories;

§§Peanuts or any other nuts providing a similar amount of calories and proteins; 8-10 glasses of water/liquid should be ensured for successful lactation

Note:1 Cup =250 ml; 1 plate pulao or dal or vegetables (½ cup or 125 g cooked food); 1 bowl fresh salad= (1 cup or 250g); 1 serving peanuts=30g peanuts

Cost of healthy diets

The estimated cost of sample menus given above varies from Pak. Rupees (Rs.) 100-150 ($1-1.50) for the whole menu per day. It is a fact that quality nutrient dense foods and diets will cost more than the monotonous unhealthy diets. However, consuming nutrient balanced diets including the recommended servings of milk and milk products, meat and pulses, cereals, vegetables and fruits, result in long-term benefits to consumers in terms of higher earnings and savings, improved health, improved physical productivity, reduced incidence of diseases and decreased medical costs.

Individuals with low income need to prioritize their household budgets to allocate a decent amount of money for food and re-appropriate expenditure towards purchase of healthy nutrient rich diets. The government may strengthen its social safety net programmes by providing food support in the form of food vouchers/coupons through an appropriate food distribution system, agriculture inputs support to the small holders and link the farmers with markets, food distribution system, and promote kitchen gardening. Food may also be provided at subsidized rates to individuals living below the poverty line. Dietary guidelines can be used as an effective tool to promote nutrition literacy among individuals. Nutrition education and awareness play a significant role in enabling individuals in general, and women in particular, to make healthy, wise and appropriate food choices for themselves and their families to purchase nutritious food. Homestead food production should be encouraged through small-scale kitchen gardening to access fresh vegetables, herbs, fruits; backyard poultry and small ruminant livestock production. These interventions would help to reduce the cost by adjusting food purchase from market and improve household food budgeting.

Prefer home-cooked food. Learn nutritious recipes and cook your own food. Prepare and eat healthy meals at home, which are more delicious, nutritious, economical and safe.

DIETARY MESSAGES

Dietary messages have been developed in the light of scientific knowledge and epidemiological evidence to address nutritional and public health problems and to reduce and control the incidence of diseases and premature deaths. Efforts are made to make the dietary messages simple, easy, specific, comprehendible, meaningful, sensitive and culturally appropriate.

Maintain normal body weight by consuming all food groups and performing regular physical activity

Maintaining a normal (healthy) bodyweight through healthy dietary practices and regular exercise is vital for longevity and wellbeing, as both underweight and overweight are associated with increased prevalence of morbidity and mortality. Dietary diversification with regular exercise can minimize the adverse effects of obesity and overweight on health. Individuals who maintain normal body weight and are physically active have the lowest incidence of chronic disease and mortality.

Half of your daily cereals intake should include wholegrains

Whole grain cereals are good sources of providing energy, dietary fibre, proteins, carbohydrates, vitamins, minerals and antioxidants to the human body. They have been associated with reducing the risk of developing hypertension, metabolic syndrome, coronary heart disease, diabetes, cancers and other diseases.

Consumption of refined wheat and wheat products (pasta, noodles, white bread and other bakery products), rice and other cereals with low or negligible levels of dietary fibre have been linked to increased risk of digestive problems and colorectal cancers. About 45-65% of total calories shall come from carbohydrate containing foods[103].

Eat five servings of fresh vegetables and fruits a day

Leafy green, deep yellow and red vegetables and fruits are rich sources of vitamin A and C, folic acid, iron, dietary fibre, potassium and antioxidants. They are free of fat and cholesterol, low in calories and contain many other beneficial compounds that prevent from overweight, obesity and incidence of chronic diseases and cancers. Five servings of vegetables and fruits per day are recommended for optimum health. According to latest research it has been demonstrated that colourful fruits and vegetables possess anti-inflammatory and anti-carcinogenic potential.

Take two to three servings of milk and milk products in a day

Milk and milk products are rich sources of calcium, phosphorous, magnesium, vitamin D, lactose, protein and fat, which are essential for skeletal growth and development. Adequate consumption of dairy products has been associated with strong bones and increased cognitive and physical outputs. For individuals who are overweight and obese or having cardiovascular diseases, skim milk is a preferred choice. Inadequate consumption of dairy products and lack of exposure to sunlight leads to rickets, osteomalacia and

osteoporosis later in life. Two to three servings of milk and milk products per day are recommended to meet calcium and other essential nutrient requirements of the body.

Consume meat and meat products, fish and eggs in moderation

Meat and meat products, fish and eggs are rich in proteins, iron, zinc, vitamin A, vitamin B12 and integral component of hormones, enzymes and body immune system. Meat without fat (lean meat) is recommended over fatty meat (non-lean meat). Fish is recommended at least once in a week to supply protein and essential fatty acids to the body for growth and brain development. Excess amount of beef, sheep and goat meats shall be avoided to prevent high intake of saturated fat and cholesterol. Consumption of non-lean meat has been associated with increased cardiovascular diseases, breast and prostate cancers. Two to three servings of meat and meat products, chicken, fish and eggs per day are recommended to fulfil protein and other essential nutrient requirements of the body.

Encourage consumption of pulses to attain healthy growth

Pulses are rich in protein, dietary fibre, vitamins, minerals and essential amino acids particularly lysine, which complement the nutrients profile of wheat, rice and other cereals when consumed together. The protein content of pulses is almost equivalent to meat protein and therefore, could be used as a substitute where there is a shortage of meat or expensive to afford. They could be used as preventive and therapeutic diets, as they tend to lower the risk of chronic non-communicable diseases i.e., hyperlipidaemia, heart diseases, hypertension, diabetes and cancers.

Consume fortified flour, grains and their products

Fortified wheat flour and cereals are good sources of energy, proteins, vitamins and minerals. Use of diversified and fortified foods should be preferred to complement nutrients intake and combat macro and micronutrients deficiencies, improve health status and reduce risk of diseases. Micronutrient fortification has led to significant improvements in micronutrient status of women and children and reduction in prevalence of goiter, neural tube defects and other associated defects.

Limit consumption of edible oil and fat in cooking

Non-communicable diseases including diabetes, hypertension, cardiovascular diseases and cancers are reaching an epidemic proportion in Pakistan. These are responsible for the increasing burden on the health care system, human sufferings and premature deaths adversely affecting productivity and socio-economic development of the country. Consumption of saturated fat and trans-fatty acids increases low density lipoproteins (LDL) and cholesterol (bad fat) that increase the risk of hypertension and cardiovascular diseases. Evidence suggests that replacement of saturated fat and trans-fatty acids, with unsaturated plant oils reduces bad fat (LDL & cholesterol) and increases good fat (high density lipoprotein) that decreases the risk of CVDs.

Reduce sugar intake, and limit intake of soft drinks, confectionaries, bakery products and commercial fruit drinks

Sugar sweetened drinks and foods with high sugar should be limited. Soft drinks, confectionaries, bakery products and commercial fruit drinks are energy dense foods and provide only calories that increase the risk of overweight and obesity. These foods also contain large amount of sugar. Consumption of soft drinks and commercial sweet carbonated beverages has been strongly associated with increased weight gain, diabetes and pancreatic cancer. Consumption of complex carbohydrates is preferred over simple sugars. Reduction in intake of sugar intake, soft drinks, confectionaries, bakery products, sweets and commercial sweetened fruit drinks is recommended.

Limit salt in cooking and always use iodized salt

In Pakistan, salt is more frequently used in diets, pickles and processed foods, and a potential risk factor for hypertension and other cardiovascular diseases. A positive association has been found between salt intake, hypertension, strokes and premature deaths. Salty foods are high in sodium. Sodium is one of the main dietary contributors to hypertension (high blood pressure). Even a small (1 g per person per day) reduction in salt intake will reduce deaths from strokes and heart attacks by more than 7% in each country. Avoid sprinkling of salt on fruits (oranges, lemons, grapefruits, guava, peaches, plums etc.) and beverages (soft drinks and orange, grape, peach, plum juices). Reduction in salt intake (< 5 g/day) is recommended for optimum health.

Limit consumption of fatty foods and highly processed foods

To improve health and nutritional status, substitution of junk (empty calories) and deep fried foods with healthy foods is essential. It is well established that consumption of junk and deep fried foods promote overweight and obesity that predispose children and adults to increased occurrence of diseases, resulting in impaired productivity and economic outputs. Highly processed foods, especially packaged, ready-made foods, are often high in fat, sugar and or salt and should be avoided. Eating raw vegetables and fruits and choosing fresh foods instead of packaged foods will contribute to a healthy diet.

Change sedentary lifestyle to physically active lifestyle

Physical activity is essential for skeletal growth and development, weight management, prevention of non-communicable diseases, increased productivity and better quality of life. At least half-hour or more moderate exercise (e.g. walking) per day is recommended for physical fitness/health.

Exclusively breastfeed the baby in the first six months and continue breastfeeding along with complementary feeding at least for two years

Breast milk is a complete food for the first six months of life. It provides all the essential nutrients required by the baby for growth and development and therefore, no other liquid or food is required until the age of six months. After the age of six months, breastfeeding shall be complemented by nutrient dense and better varieties of safely prepared foods according to the infant and child's age. In order to allow child skin to form vitamin D, children over the age of six months should be exposed to sunlight in the early morning or late afternoon for few minutes a day or twice a week.

Women should increase intake of all the food groups daily, especially foods that are rich in iron and take extra care during pregnancy and lactation

Pregnancy and lactation impose extra demands of macro and micronutrients on women to support foetal growth and development, breastfeed the baby after birth and meet the nutritional requirements by eating varieties of safe and nutritious foods, especially foods that are rich in iron and other micronutrients. Folic acid supplement during first trimester is necessary to prevent congenital malfunctioning. Appropriate and safe spacing between pregnancies will contribute towards improving the health of mother and baby.

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Drink plenty of water each day

Drinking at least 8 glasses of clean and safe water per day is recommended for proper body functions. For a reference person of 65 kg, minimum required amount of drinking water is 2 litres (8 glasses) including all fluids. The requirement may vary according to the conditions (age, weather, work/activities, physiological status etc.).

Read nutrition labeling on packaged food products

Reading nutrition labels on packaged foods provide important information on the nutrients and food additives present in foods. Nutrition labelling facilitates the consumer to select the right and healthy food and enables to compare the nutrients composition of different brands of food products for better selection.

ANNEXURE-I: Personal hygiene and five keys to safer food*

- **Keep clean**
  a. Wash your hands before handling food and often during preparation
  b. Wash your hands after going to toilet
  c. Wash and sanitize all surfaces and equipment used for food preparation
  d. Protect kitchen areas and food items from insects, pests and other animals
- **Separate raw and cooked foods**
  a. Separate raw meat, poultry and seafood from other foods
  b. Use separate equipment and utensils such as knives and cutting boards for handling raw and prepared foods
- **Cook thoroughly**
  a. Cook food thoroughly, especially meat, poultry, eggs and seafood
  b. Bring foods like soups and stews to boiling to make sure that they have reached 70 °C. For meat and poultry, make sure that juices are clear, not pink
  c. Reheat cooked food thoroughly
- **Keep food at safe temperatures**
  a. Do not leave cooked food at room temperature for more than 2 hours
  b. Refrigerate promptly all cooked and perishable food (preferably below 5°C)
  c. Keep cooked food piping hot (more than 60°C) prior to serving
  d. Do not store food too long even in the refrigerator
  e. Do not thaw frozen food at room temperature
- **Use safe water and raw foods**
  a. Use safe water or treat it to make it safe
  b. Select fresh and wholesome foods
  c. Wash fruits and vegetables, especially if eaten raw
  d. Do not use food beyond its expiry date

*http://www.who.int/foodsafety/publications/consumer/manual_keys.pdf

ANNEXURE-II: Foods rich in omega fatty acids (to be consumed according to recommended servings)

Foods rich in omega-3 fatty acids (Alpha-linolenic acids)	Foods rich in omega-6 fatty acids (Linoleic acid)	Foods rich in omega-9 fatty acids (Oleic and Erucic acids)
Salmon	Grains	Olives
Sardine	Nuts	Hazelnuts
Trout	Olive oil	Pecans
Tuna	Sunflower oil	Cashews
Mackerel	Safflower oil	Pistachios
Grains, Walnuts		

Oil and fat with different fatty acids composition

Oils high in unsaturated fatty acids	Oil and fat high in saturated fatty acids	Potential source of trans fatty acids
Corn oil	Coconut Oil	Margarine and vegetable ghee
Cotton seed oil	Palm Oil	Vanaspati ghee
Peanut oil	Butter	Deep fried food prepared in partially hydrogenated fat or oil repeatedly used for deep frying
Soybean oil	Hydrogenated oil	Bakery products prepared in partially hydrogenated fat or oil repeatedly used for deep frying
Sunflower oil	Fat from whole milk	
Olive oil	Fat from beef, mutton, chicken	
Sesame seed oil	Ghee	

Dietary recommendations for oil and fat

- Energy intake from fat should not exceed 20-35 % of total caloric intake
- Consume less than 10% of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.
- Dietary cholesterol be limited to a maximum of 300mg/day
- Keep trans-fat consumption as low as possible by limiting foods that contain synthetic sources of trans fats and by limiting other solid fats.
- Reduce the intake of calories from solid fat.
- Use oils to replace solid fats where possible*
- Avoid or reduce consumption of deep-fried foods and junk foods
- Reduce consumption of refined bakery products.
- Cook your own food and eat healthy meals at home, which are more nutritious and safe.
- Avoid or reduce consumption of Kababs prepared in ghee
- Avoid or reduce consumption of beef, mutton and chicken prepared in ghee
- Avoid or reduce the consumption of ghee in daily cooking
- Remove extra fat from meat and remove the skin from chicken

*Williams' basic nutrition and diet therapy, 14th Edition

ANNEXURE-III: Recommended daily allowances for Pakistani population for selected major nutrients*

Age (years)	Weight (kg)	Energy (kcal)	Protein (g)	Vitamin A (RE)	Vitamin D (ug)	Iron (mg)	Iodine (ug)	Zinc (mg)
Children (boys and girls)								
0-1	7.3	820	12	350	10	15	50	15
1-3	11.9	1250	23	400	10	20	90	15
3-5	15.9	1510	26	400	8.3	20	90	15
5-7	19.6	1710	30	400	4.2	20	90	15
7-10	25.9	1880	38	400	2.5	25	120	15
Children (boys)								
10-12	34.0	2170	50	500	2.5	35	120	15
12-14	43.2	2360	64	600	2.5	35	150	15
14-16	54.5	2620	75	600	2.5	30	150	15
16-19	63.6	2820	84	600	2.5	30	150	15
Children (girls)								
10-12	35.4	1925	52	500	2.5	30	120	15
12-14	44.2	2040	62	600	2.5	30	150	15
14-16	51.5	2135	69	550	2.5	20	150	15
16-19	54.6	2150	66	500	2.5	20	150	15
Men moderately active – average 25 years	55	2550	0.57 g/kg	750	2.5	20	150	15
Women moderately active _ childbearing age	46	2160	0.52 g/kg	750	2.5	30	150	20
Pregnant	--------	+350	+10	750	10	40	200	20
Lactating	---------	+350	+26	1200	10	30	200	25

*Food Composition Table for Pakistan, Department of Agricultural Chemistry, University of Agriculture, Peshawar[95]

ANNEXURE IV: Dietary Reference Intakes Across life Stage Group[96, 115]

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Total Water, Fiber, Essential Fatty Acids, and Protein;* Food and Nutrition Board, Institute of Medicine, National Academies

LIFE STAGE GROUP	TOTAL WATER[a] (L/d)	TOTAL FIBER (g/d)	LINOLEIC ACID (g/d)	α-LINOLEIC ACID (g/d)	PROTEIN[b](g/d)
Infants					
Birth to 6 mo	0.7*	ND	4.4*	0.5*	9.1*
6 to 12 mo	0.8*	ND	4.6*	0.5*	**11.0**
Children					
1-3 yr	1.3*	19*	7*	0.7*	**13**
4-8 yr	1.7*	25*	10*	0.9*	**19**
Males					
9-13 yr	2.4*	31*	12*	1.2*	**34**
14-18 yr	3.3*	38*	16*	1.6*	**52**
19-30 yr	3.7*	38*	17*	1.6*	**56**
31-50 yr	3.7*	38*	17*	1.6*	**56**
51-70 yr	3.7*	30*	14*	1.6*	**56**
>70 yr	3.7*	30*	14*	1.6*	**56**
Females					
9-13 yr	2.1*	26*	10*	1.0*	**34**
14-18 yr	2.3*	26*	11*	1.1*	**46**
19-30 yr	2.7*	25*	12*	1.1*	**46**
31-50 yr	2.7*	25*	12*	1.1*	**46**
51-70 yr	2.7*	21*	11*	1.1*	**46**
>70 yr	2.7*	21*	11*	1.1*	**46**
Pregnancy					
14-18 yr	3.0*	28*	13*	1.4*	**71**
19-30 yr	3.0*	28*	13*	1.4*	**71**
31-50 yr	3.0*	28*	13*	1.4*	**71**
Lactation					
14-18 yr	3.8*	29*	13*	1.3*	**71**
19-30 yr	3.8*	29*	13*	1.3*	**71**
31-50 yr	3.8*	29*	13*	1.3*	**71**

Source: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005) and Dietary Reference Intakes for water, Potassium, Sodium, chloride, and Sulfate* (2005). The report my be accessed via www.nap.edu.

Note: This table (taken from the DRI reports, see www.nap.edu) presents Recommended dietary allowances (RDA) in **boldface type** and adequate Intakes (AIs) in ordinary type followed by and asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97%-98%) healthy individuals in a group. It is calculated from and Estimated Average Requirement (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

[a]Total water includes all water contained in food, beverages, and drinking water.

[b]Based on grams of protein per kilogram of body weight for the reference body weight (e.g., for adults 0.8 g/kg body weight for the reference body (weight).

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Vitamins*; Food and Nutrition Board, Institute of Medicine, National Academies

LIFE STAGE GROUP	VITAMIN A (mcg/d)[a]	VITAMIN C (mg/d)	VITAMIN D (IU/d)[b,c]	VITAMIN E (mg/d)[d]	VITAMIN K (mcg/d)	THIAMIN (mg/d)	RIBOFLAVIN (mg/d)	NIACIN (mg/d)[e]	VITAMIN B_6 (mg/d)	FOLATE (mcg/d)[f]	VITAMIN B_{12} (mcg/d)	PANTOTHENIC Acid (mg/d)	BIOTIN (mcg/d)	CHOLINE[g] (mg/d)
Infants														
Birth to 6 mo	400*	40*	400	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	1.7*	5*	125*
6 to 12 mo	500*	50*	400	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1.8*	6*	150*
Children														
1-3 yr	**300**	**15**	**600**	**6**	30*	**0.5**	**0.5**	**6**	**0.5**	**150**	**0.9**	2*	8*	200*
4-8 yr	**400**	**25**	**600**	**7**	55*	**0.6**	**0.6**	**8**	**0.6**	**200**	**1.2**	3*	12*	250*
Males														
9-13 yr	**600**	**45**	**600**	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14-18 yr	**900**	**75**	**600**	**15**	75*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	25*	550*
19-30 yr	**900**	**90**	**600**	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
31-50 yr	**900**	**90**	**600**	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
51-70 yr	**900**	**90**	**600**	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[h]	5*	30*	550*
> 70 yr	**900**	**90**	**800**	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[h]	5*	30*	550*
Females														
9-13 yr	**600**	**45**	**600**	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14-18 yr	**700**	**65**	**600**	**15**	75*	**1.0**	**1.0**	**14**	**1.2**	**400**	**2.4**	5*	25*	400*
19-30 yr	**700**	**75**	**600**	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**	**2.4**	5*	30*	425*
31-50 yr	**700**	**75**	**600**	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**	**2.4**	5*	30*	425*
51-70 yr	**700**	**75**	**600**	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[h]	5*	30*	425*
> 70 yr	**700**	**75**	**800**	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[h]	5*	30*	425*
Pregnancy														
14-18 yr	**750**	**80**	**600**	**15**	75*	**1.4**	**1.4**	**18**	**1.9**	**600**[j]	**2.6**	6*	30*	450*
19-30 yr	**770**	**85**	**600**	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[j]	**2.6**	6*	30*	450*
31-50 yr	**770**	**85**	**600**	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[j]	**2.6**	6*	30*	450*
Lactation														
14-18 yr	**1200**	**115**	**600**	**19**	75*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
19-30 yr	**1300**	**120**	**600**	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
31-50 yr	**1300**	**120**	**600**	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*

Sources: Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids (2000); Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); Dietary Reference Intakes for Water, Potassium, Sodium Chloride, and Sulfate (2005); and Dietary Reference Intakes for Calcium and Vitamin D (2011). These reports may be accessed via www.nap.edu.

*Note: This table (taken from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDAs) in **boldface type** and Adequate Intakes (AIs) in **lightface** type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97% 98%) healthy individuals in a group. it is calculated from an Estimated Average Requirements (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence of the percentage of individuals covered by this intake.

[a]As retinol activity equivalents (RAEs), 1 RAE= 1 mcg of retinol, 12 mcg of β-carotene, 24 mcg of α-carotene, or 24 mcg of β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is twofold greater than retinol equivalents (REs), Whereas the RAE for preformed vitamin A is the same as the RE for vitamin A.

[b]As cholecalciferol. 1 mcg of cholecalclferol = 40 IU of vitamin D.

[c]Under the assumption of minimal sunlight.

[d]As α-tocopherol. α-Tocopherol includes RRR α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the 2R-stereoisomeric forms of α-tocopherol (RRR-, RSR-, RRS-, and RSS-α-tocopherol) that occur in fortified foods and supplements. It does not include the 2S-stereoisomeric forms of α-tocopherol (SSR-,SSR-, SRS-, and SSS-α- tocopherol),also found in fortified foods and supplements.

[e]As niacin equivalents (NEs). 1 mg of niacin = 60 mg of tryptophan; 0-6 months = preformed niacin (not NE).

[f]As dietary folate equivalents (DFEs). 1 DFE= 1 mcg of food folate = 0.6 mcg of folic acid from fortified food or as a supplement consumed with food = 0.5 mcg of a supplement taken on an empty stomach.

[g]Although AIs have been established for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

[h]Because 10% to 30% of older people may malabsorb food-bound B12, it is advisable for those older than 50 year to meet their RDA mainly by consuming foods fortified with B12 or a supplement containing B12.

[i]In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 mcg from supplements or fortified foods in addition to intake of food folate from a varied diet.

[j]It is assumed that women will continue consuming 400 mcg from supplements of fortified food until their pregnancy is confirmed and they enter prenatal care, which ordinarily occurs after the end of the percionceptional period -the critical time for formation of the neural tube.

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Minerals; Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Calcium (mg/d)	Chromium (mcg/d)	Copper (mcg/d)	Fluoride (mg/d)	Iodine (mcg/d)	Iron (mg/d)	Magnesium (mg/d)	Manganese (mg/d)	Molybdenum (mcg/d)	Phosphorus (mg/d)	Selenium (mcg/d)	Zinc (mg/d)	Potassium (g/d)	Sodium (g/d)	Chloride (g/d)
Infants															
Birth to 6 mo	200*	0.2*	200*	0.01*	110*	0.27*	30*	0.030*	2*	100*	15*	2*	0.4*	0.12*	0.18*
6 to 12 mo	260*	5.5*	220*	0.5*	130*	11	75*	0.6*	3*	275*	20*	3*	0.7*	0.37*	0.57*
Children															
1-3 yr	**700**	11*	**340**	0.7*	**90**	**7**	**80**	1.2*	**17**	**460**	**20**	**3**	3.0*	1.0*	1.5*
4-8 yr	**1000**	15*	**440**	1*	**90**	**10**	**130**	1.5*	**22**	**500**	**30**	**5**	3.8*	1.2*	1.9*
Males															
9-13 yr	**1300**	25*	**700**	2*	**120**	**8**	**240**	1.9*	**34**	**1250**	**40**	**8**	4.5*	1.5*	2.3*
14-18 yr	**1300**	35*	**890**	3*	**150**	**11**	**410**	2.2*	**43**	**1250**	**55**	**11**	4.7*	1.5*	2.3*
19-30 yr	**1000**	35*	**900**	4*	**150**	**8**	**400**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
31-50 yr	**1000**	35*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
51-70 yr	**1000**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.3*	2.0*
>70 yr	**1200**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.2*	1.8*
Females															
9-13 yr	**1300**	21*	**700**	2*	**120**	**8**	**240**	1.6*	**34**	**1250**	**40**	**8**	4.5*	1.5*	2.3*
14-18 yr	**1300**	24*	**890**	3*	**150**	**15**	**360**	1.6*	**43**	**1250**	**55**	**9**	4.7*	1.5*	2.3*
19-30 yr	**1000**	25*	**900**	3*	**150**	**18**	**310**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
31-50 yr	**1000**	25*	**900**	3*	**150**	**18**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
51-70 yr	**1200**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.3*	2.0*
>70 yr	**1200**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.2*	1.8*
Pregnancy															
14-18 yr	**1300**	29*	**1000**	3*	**220**	**27**	**400**	2.0*	**50**	**1250**	**60**	**12**	4.7*	1.5*	2.3*
19-30 yr	**1000**	30*	**1000**	3*	**220**	**27**	**350**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
31-50 yr	**1000**	30*	**1000**	3*	**220**	**27**	**360**	2.0*	**50**	**700**	**60**	**11**	4.7	1.5*	2.3*
Lactation															
14-18 yr	**1300**	44*	**1300**	3*	**290**	**10**	**360**	2.6*	**50**	**1250**	**70**	**13**	5.1*	1.5*	2.3*
19-30 yr	**1000**	45*	**1300**	3*	**290**	**9**	**310**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*
31-50 yr	**1000**	45*	**1300**	3*	**290**	**9**	**320**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*

Sources: Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids (2000); Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); Dietary Reference Intakes for Water, Potassium, Sodium Chloride, and Sulfate (2005); and Dietary Reference Intakes for Calcium and Vitamin D (2011). These reports may be accessed via www.nap.edu.

***Note:** This table (taken from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDAs) in **boldface type** and Adequate Intakes (AIs) in lightface type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a group. it is calculated from an Estimated Average Requirements (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence of the percentage of individuals covered by this intake.

ANNEXURE-V: Recommendations for infant and young child feeding[101]

- Initiate breastfeeding within 1 hour of birth
- Exclusive breastfeeding for the first six months
- Continue breastfeeding until 2 years of age or beyond
- Introduce complementary feeding at six months with small amounts of food and increase gradually as the child gets older
- Gradually modify the texture and consistency of food and add variety
- Be responsive to infant and child needs i.e., feed infant directly and assist older children
- Feed child slowly and patiently and encourage them to eat but do not force
- Practice good hygiene by washing hands frequently with soap particularly before preparing and eating foods and after using the toilet, use clean utensils and ensure proper food handling
- Prepare complementary foods from locally available foods
- Feed infants (aged 6-8 months) 2-3 times daily with soft foods which are easily digested by infants (banana, mashed potato, thick porridge, kheer, vegetable soup, kitchri) in addition to breast milk
- Feed infant (aged 9-11 months) 3-4 times daily with soft foods which are easily digested by infants (banana, mashed potato, bread, thick porridge, kheer, egg, vegetable soup) in addition to breast milk
- Feed child (aged 12-23 months) 3-4 times daily with homemade foods which are nutritious and digestible plus 1-2 additional snacks (bread, vegetables, egg, sandwich, banana, kheer, apple or any other fruit, egg, fish, chicken etc.) in addition to breast milk
- Avoid giving sweets, candies, bakery products and sugar sweetened beverages to children, and replace them with healthy foods such as fruits and vegetables, beans and pulses, nuts and dairy products
- Serve child with fortified cereals or vitamin-mineral supplements as needed
- Increase fluid intake including more breastfeeding and offer soft food to infants and children during illness

*http://www.who.int/mediacentre/factsheets/fs342/en/

Pakistan infant and young child feeding strategy, 2016-2020

ANNEXURE-VI: Complementary foods for infants > 6 months

KITCHRI

Ingredients	Amount(g)*
Rice	60
Dal Mung	30
Fat/Oil (g)	5

Preparation

Clean and wash rice with clean water and dal mung. Soak for ½ hour. Take one cup of water, rice, dal mung and rice in a deep saucepan. Cook on medium flame for 20-25 minutes till rice and dal mung become soft. Mash these and add one teaspoon of hot oil/fat, remove from the flame and serve warm.

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RICE KHEER

Ingredients	Amount(g)
Rice	60
Milk	30

Preparation

Clean and wash rice with clean water and soak for ½ hr. Add ½ cup of water and rice in a deep saucepan. Cook on medium flame for 20-25 minutes till rice becomes soft. Mash rice with spoon or electric blender. Mix milk to it and again cook on medium flame for 10 minutes till it becomes soft and creamy in consistency and serve warm.

© FAO/Parvez Iqbal Paracha

SUJI KHEER

Ingredients	Amount(g)
Suji	20
Milk	120

Preparation

Roast suji without oil in a deep saucepan till it becomes brown. Add milk to it and cook on medium flame for 10-15 minutes till it becomes soft and creamy in consistency. Turn off the flame and serve warm.

WHEAT DALIA

Ingredients	Amount (g)
Dalia (shredded wheat)	20
Milk	120
Water	200

Preparation

Thoroughly clean dalia and soak for ½ hr. Add 1 cup of water and dalia in a deep saucepan. Cook on low flame for 15-20 minutes till it becomes tender. Turn off the flame. Add milk and serve warm.

BANANA KHEER

Ingredients	Amount (g)
Banana	80
Milk	120

Preparation

Peel and mash banana with spoon. Add boiled milk. Mix to creamy consistency.

Food Composition Table for Pakistan, Department of Agricultural Chemistry, University of Agriculture, Peshawar[95].

The amount of sugar and salt is removed from the recipes as per WHO recommendations[109].

* One table spoon = 15g, one tea spoon = 5g

ANNEXURE-VII: Food and serving size for different age groups

Food Group	No. of Servings/day							Portion size/Exchanges
	2-3 years	3-10 years	10-19 years	19-60 years	>60 years	Pregnant women	Lactating women	
Milk and milk products (Each Serving = 15 g carbohydrate, 8 g protein, 8 g fat, 160 calories	2	2-3	3-4	2-3	2-3	2-3	3-4	Whole Milk= 1cup Yogurt = 1 cup Cheese= 1 slice Kheer or Feerni= 1 cup Other milk-based products equivalent to nutrients supplied by 1 cup of milk
Cereals Each Serving = 30g carbohydrate, 6 g protein, 0-2 g fat, 160 calories	1-2	2-4	5-6	4-5	4-5	5-6	6-7	Bread (toast)= 2 slices Chapatti = 1 Cooked rice = 1 cup Cereals equivalent to nutrients supplied by 2 slices of bread
Vegetables Each serving = 5 g carbohydrates, 2 g protein and 25 calories **Starchy Vegetables:** Each serving =15 g carbohydrates, 3 g protein, 0-1 g Fat and 80calories	1-2	1-2	2-3	2-3	2-3	2-3	2-3	Cooked non-starchy vegetables=½ cup; Vegetables juice/soup= ½ cup Fresh vegetables/salad= 1cup ***Starchy Vegetables*** Potato= 1(100 g) Maize = ½ cup Peas green= ½ cup
Fruits Each serving=15 g carbohydrates and 80 calories	1-2	1-2	2-3	2-3	2-3	2-3	2-3	Banana=1(medium size) or Apple= 1 or Peach=1 or Plums=2-3 or Apricots=3-4
Meat and pulses • One serving of ***lean meat*** = 7 g protein, 3 g fat and 55 calories • One serving of ***meat with medium fat*** = 7 g protein, 5 g fat and 75 calories • One serving of ***meat with high fat*** =7 g protein, 8 g fat and 100 calories	1-2	1-2	2-3	2-3	2-3	*2-3*	2-3	Lean meat=28 g(2-3 small pieces) or Fish= 1-2 pieces or Egg=1 or Cooked pulses=½ cup

ANNEXURE-VIII: Food as a source of nutrients

Food	Nutrients
Cereal grains and grain products	Carbohydrates (starch, dietary fibre), proteins, vitamins (thiamine, riboflavin, niacin, vitamin E, folate), minerals (iron, zinc, phosphorous, magnesium)
Milk and milk products	Carbohydrates (lactose), proteins, fats, vitamins (vitamin A, vitamin B12), minerals (calcium, phosphorous, magnesium)
Meat and pulses	Proteins (amino acids), fats, vitamins (vitamin B12) and minerals (iron, zinc)
Vegetables	Vitamins (B-carotene, B6, vitamin C, folic acid), minerals (iron, zinc, potassium), antioxidants, dietary fibre
Fruits	Vitamins (B-carotene, B6, vitamin C, folic acid), minerals (iron, zinc, potassium), antioxidants, dietary fibre
Oil and fat	Cholesterol and fatty acids

ANNEXURE-IX: Examples of energy and nutrient rich foods

A. Energy rich foods

1. Cereal grains and grain products (wheat, maize, rice, oat, barley, millet)
2. Starchy vegetables (potatoes, etc.)
3. Oil and Fat

B. Nutrient Rich Foods

1. Protein source foods

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- Eggs
- Beef, mutton, chicken, fish
- Pulses (chickpea, red beans, lentil, mash and mung beans)
- Nuts (peanuts, almond, walnuts)
- Milk

2. Iron source foods

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- Organ Meat (Liver, kidney)
- Beef and mutton
- Chicken and fish
- Egg yolk
- Pulses
- Spinach, broccoli and other dark green leafy vegetables
- Dried apricots, figs, dates, etc.
- Fortified cereals

3. Zinc source foods

- Beef, mutton, fish
- Pulses
- Whole grain cereals
- Fortified cereals

4. Calcium source foods

- Milk and milk products (yogurt, lassi, cheese)
- Cabbage, broccoli, okra and other dark green leafy vegetables

5. Phosphorus source foods

- Milk, yogurt, cheese
- Beef, mutton, chicken, seafood
- Pulses
- Nuts

6. Vitamin A source foods

- Liver
- Colostrum
- Breast milk
- Dark green, yellow and red vegetables (spinach, pumpkin, carrots, turnips)
- Dark yellow and red fruits (watermelon, apricots, mangoes, strawberries)
- Milk, yogurt, cheese and butter
- Egg yolk

7. Folate source foods

- Liver and kidney
- Dark green leafy vegetables
- Fortified cereals
- Egg yolk

8. Vitamin C source rich foods

- Fruits: guava, orange, lime, melon, grapefruit, apple etc
- Dark green leafy vegetables
- Tomatoes
- Bell peppers/capsicum

9. Potassium source foods

- Banana, avocado, orange,
- Potatoes, beans, lentils, tomatoes, spinach, mushrooms
- Dried fruits (apricots, peaches, raisins)
- Fish
- Yogurt

ANNEXURE-X Minimize usage of the following foods

1. Sodium source foods

- Table salt, baking powder
- Pickles, canned vegetables
- Canned processed foods, fast foods
- Potato crisps & snacks, roasted and salted popcorns
- Roasted and salted nuts
- Salted cheese, instant soups
- Sauces and salad dressings

2. Potential source of trans-fat

- Fried foods in hydrogenated fats
- Bakery products
- Frosting in bakery products
- Margarine & industrially processed fats
- Highly processed foods

3. Sugar source foods

- White sugar, brown sugar
- Bakery products
- Soft drinks and sugar added beverages/juices

ANNEXURE-XI: Recommendations for salt reduction (WHO)[32]

Salt consumption at home can be reduced by:

- Not adding salt during the preparation of food (or gradually reducing it)
- Not having a salt shaker on the table;
- Limiting the consumption of salty snacks;
- Choosing products with lower sodium content.

Other local practical actions to reduce salt intake include:

- Integrating salt reduction into the training curriculum of food handlers;
- Removing salt shakers and soy sauce from tables in restaurants; Introducing product or shelf labels
- Making it clear that certain products are high in sodium;
- Providing targeted dietary advice to people visiting health facilities;
- Advocating for people to limit their intake of products high in salt and advocating that they reduce the amount of salt used for cooking; and
- Educating children and providing a supportive environment for children so that they start early with adopting low salt diets.

Actions by the food industry should include:

- Incrementally reducing salt in products over time so that consumers adapt to the taste and don't switch to alternative products;
- Promoting the benefits of eating reduced salt foods through consumer awareness activities in food outlets;
- Reducing salt in foods and meals served at restaurants and catering outlets and labelling sodium content of foods and meals.

*https://www who.int/news-room/fact-sheets/detail/salt-reduction

ANNEXURE-XII: Healthy snack examples

- All seasonal fruits (banana, apple, guava, grapes, mango, chiko, dates, melon, watermelon)
- Milk and milk products (lassi, yogurt, cheese, milk shake with fruits like banana, mango, strawberry, apple) provided minimum or nil added sugar
- Fresh salad and green, yellow and red vegetables
- Roasted pulses and beans
- Potato cutlets
- Shami kabab
- Shami sandwich with fresh salad
- Chicken sandwich with fresh salad
- Potato cutlet sandwich with fresh salad
- Cheese sandwich with fresh salad
- Egg sandwich with fresh salad
- Fruit chat
- Chana chat
- Dahi baray
- Nuts and dried fruits

ANNEXURE-XIII: Recommendations on physical activity for different age groups[*75]

Children and youth aged 5–17 years: Moderate-to-vigorous-intensity physical activity at least 60 minutes daily. The daily physical activity should preferably be aerobic and vigorous-intensity activities including muscle and bone strengthening exercises should be undertaken at least 3 times per week.

Adults aged 18-64 years: Moderate intensity physical activity (brisk walking, cycling, gardening, playing games, washing and cleaning clothes, car washing etc.) of 30 minutes at least five days a week or 15 minutes of vigorous intensity physical activity (weight lifting, running, bicycling, playing games, jumping ropes, heavy gardening etc.) at least five days a week or a combination of both if possible. Aerobic activity should be performed in bouts of at least 10 minutes duration. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

Older adults: At least 30 minutes of moderate intensity aerobic physical activity daily or 15 minutes vigorous intensity aerobic physical activity daily or an equivalent combination of moderate to vigorous intensity activity are recommended. Older adults with poor mobility should perform physical activity to enhance their balance and prevents falls on 3 or more days per week. Muscle strengthening activities involving major muscles should also be done on 2 or more days a week. Older adults unable to perform moderate or vigorous intensity physical activity due to poor health should be physically active as their abilities and conditions permits.

*http://www.who.int/mediacentre/factsheets/fs385/en/

ANNEXURE-XIV Equivalent weights and measures[113]

Weights and Measures

Length

1 centimeter (cm) = 0.39 inches (in)
1 foot (ft) = 30 centimeters (cm)
1 inch (in) = 2.54 centimeters (cm)
1 meter (m) = 39.37 inches (in)

Weight

1 gram (g) = 0.001 kilograms (kg)
= 1000 milligrams (mg)
= .035 ounces (oz)
1 kilogram (kg) = 1000 grams (g)
= 2.2 pounds (Ib)
1 microgram (µg) = 0.001 milligrams (mg)
1 milligram (mg) = 0.001 grams (g)
= 1000 micrograms (µg)
1 ounce (oz) = 28 grams (g)
= 0.03 kilograms (kg)
1 pound (Ib) = 454 grams (g)
= 0.45 kilograms (kg)
=16 ounces (oz)

Volume

1 cup = 16 tablespoons (tbs or T)
= 0.25 liters (L)
= 236 milliliters (mL, commonly rounded to 250 mL,)
= 8 ounces (oz)
1 liter (L) = 33.8 fluid ounces (fl oz)
= 0.26 gallons (gal)
= 2.1 pints (pt)
= 1.06 quarts (qt)
= 1000 milliliters (mL)
1 milliliters ml.,) = 0.001 liters (L)
= 0.03 fluid ounces (fl oz)
1 ounce (oz)= 0.03 liters (L)
= 30 milliliters (mL)
1 pint (pt) = 2 cups (c)
= 0.47 liters (L)
= 16 ounces (oz)
1 quart (qt) = 4 cups (c)
= 0.95 liters (L)
= 32 ounces (oz)
1 tablespoon (tbs or T)= 3 teaspoons (tsp)
= 15 milliliters (mL)
1 teaspoon (tsp) = 5 milliliters (mL)
1 gallon (gal) = 16 cups (c)
= 3.8 liters (L)

Energy

1 millijoule (mJ) = 240 kcalories (kcal)
1 kilojoule (kJ) = 0.24 kcalories (kcal)
1 kcalorie (kcal) = 4.2 kilojoule (kJ)
1 g alcohol =7 kcal = 29 kJ
1 g carbohydrate = 4 kcal = 17 kJ
1 g fat = 9 kcal = 37 kJ
1 g protein = 4 kcal = 17 kJ

Temperature

To change from Fahrenheit (°F) to Celsius (°C), subtract 32 from the Fahrenheit measure and then multiply that result by 0.56.

To change from Celsius (°C to Fahrenheit (°F), multiply the Celsius measure by 1.8 and add 32 to that result.

A comparison of some useful temperatures is given below.

	Celsius	Fahrenheit
Boiling point	100 °C	212°F
Body temperature	37 °C	98.6°F
Freezing point	0°C	32°F

ANNEXURE-XV Standard Pakistani Chapatti*

Dry flour weighs: 60 gms

Cooked chapatti weighs: 80 gms

Cooked chapatti measures 8 inches diameter

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*Prepared by Food Science and Human Nutrition Department Kinnaird College for Women, Lahore.

ANNEXURE-XVI. Committees for Pakistan Dietary Guidelines for Better Nutrition

Steering/Core Committee

1	Dr. M. Azeem Khan, Member Food Security & Climate Change, Planning Commission	Chair
2	Ms Mina' Dowlatchahi, FAO Representative, Pakistan	Co-Chair
3	Mr. M. Aslam Shaheen, Chief Nutrition, MPDR	Member
4	Dr. Baseer Achakzai, Director Nutrition, MNHSRC	Member
5	Dr. Javed Humayon, Senior Joint Secretary, MNFSR	Member
6	Dr. Nomeena Anis, Nutritionist and Gender Focal Person FAO	Member
7	Prof. Jehangir, K. Khalil, Ex-Dean, Agric. University, Peshawar	Member
8	Dr. M. Sadiq Butt Dean NIFST, University of Agriculture, Faisalabad	Member
9	Dr. Rezzan Khan, Consultant Clinical Dietician, Shifa Int. Hospital	Member
10	Representative from WFP	Member
11	Representative from UNICEF	Member
12	Representative from WHO	Member

Technical Committee

1.	Mr. M. Aslam Shaheen, Chief Nutrition, MPDR	Member
2.	Dr. Baseer Achakzai, Director Nutrition, MNHSRC	Member
3.	Prof. Dr. Jehangir K. Khalil, Ex-Dean Faculty of Nutrition Sciences, Agricultural University, Peshawar	Member
4.	Dr. Rezzan Khan, Consultant Clinical Dietitian Shifa Int. Hospital	Member
5.	Dr. Nomeena Anis, Nutritionist and Gender Focal Person, FAO	Member
6.	Prof. Ghazala Pervez Zaman, College of Home Economics, Lahore	Member
7.	Prof. Dr. Tahir Zahoor, NIFS&T, University of Agric. Faisalabad	Member
8.	Dr. Hajra Ahmad, Dept. of Home and Health Sci. AIOU, Islamabad	Member
9.	Dr. Mohammad Nasir, UVAS, Lahore	Member
10.	Dr. Nilofer Fatmi, Dow University of Health Sciences, Karachi	Member
11.	Dr. Romaina Iqbal, Aga Khan University, Karachi	Member
12.	Mr. Syed Saeed Qadir, Nutrition Officer, UNICEF, Islamabad	Member
13.	Dr. Mahnaz Nasir Khan, HOD, Food Science & Human Nutrition, Kinnaird College for Women, Lahore.	Member
14.	Dr. Zia ud Din, Associate Professor, Dept. Human Nutrition, Agricultural University, Peshawar	Member
15.	Prof. Dr. Anwaar Ahmed, Institute of Food and Nutritional Sciences, PMAS-Arid Agriculture University, Rawalpindi	Member

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GLOSSARY

Adolescence	A period between 10-19 years of age associated with rapid body growth and development, time to build body nutrients stores for future increased responsibilities
Acceptable Macronutrient Distribution Range	It is the percentage of total caloric intake that should come from a particular macronutrient (carbohydrates, protein and fat) each day
Anaemia	A condition in which the number of red blood cells or their oxygen carrying capacity is insufficient to meet physiological needs (blood haemoglobin concentration falls below normal adversely affecting physical performance and productivity)
Bakery products/confectionaries	Foods which are baked, fried or prepared from cereals (mainly wheat flour) in combination with sugar, oil and salt are called bakery products. They may include breads, biscuits, cream filled rolls, cakes, confectionaries (sweets), samosa, pakora and many others. They are rich in refined carbohydrates, sugar, oil and salt and therefore, considered unhealthy.
Balanced diet	A diet which is composed of all food groups (grains, vegetables, fruit, meat and pulses, dairy products) and provide all the essential nutrients to the body in adequate amount
Basal metabolic rate	Amount of energy required to maintain metabolic functions of the human body
Clean and safe drinking water	Freshwater which is free from physical, microbial and chemical contaminants is called clean and safe drinking water
Contaminant	Any chemical, biological or any other substance that may make the food unsuitable for human consumption and possess potential health risk
Complementary feeding	A mashed food or thick porridge or soft semi-solid food introduced to the baby at the age of six months and continued till the child is on adult type diet in addition to breast milk
Exclusive breast feeding	A period from birth to six months of age when only breast milk is given to the baby, without any additional food or drink, not even water
Fortified foods	Any food to which one or more essential micronutrients like vitamins and minerals are added to increase the availability of nutrients to combat micronutrient deficiencies in population

Junk foods	Any food that provides empty calories and no other nutrients in substantial amount to meet the nutrients demand of the body. Fat and oil fried food, sugar based bakery products and confectionaries fall under the classification of junk foods
Malnutrition	A condition resulting from decreased or increased intake of foods. It includes both under-nutrition (underweight, wasting, stunting) and overweight and obesity
Macronutrient	Nutrients such as carbohydrates, proteins and fat which are required by the body in large amounts
Micronutrient	Nutrients such as vitamins and minerals which are required in small amounts
Nutrient reference value	Numerical values that are based on scientific data for purposes of nutrition labelling and nutritional intake.
Obesity	A condition characterized by increased fatness. Body mass index greater than 30 indicates obesity in adults
Overweight	A condition characterized by higher weight than normal or reference mean weight. Body mass index between 25-29.9 indicates adults with overweight
Processed Foods	Food processing refers to a variety of processes carried out in food industry or at home and restaurants to make raw food and food ingredients into an edible form to improve its appearance, taste, colour, shelf-life, digestibility and suitability for human consumption. Industrially produced processed foods are most commonly marketed in cans, card-board packages and boxes, nutritionally labelled and may be ready to eat.
Snacks	Foods and beverages consumed/eaten between two big meals are called snacks. Snacks may be classified into energy dense (soft drinks, candies, bakery products, French fries etc.) and nutrients dense (milk, fresh fruits, dry nuts and fruits, salads, meat etc.). Healthy snacks help to maintain constant supply of nutrients and prevent body from hunger and overeating to reduce the risk of overweight, obesity and chronic diseases.
Stunting	Low height for age. It reflects the cumulative effects of undernutrition and infections since and even before birth. Stunting is the result of long-term nutritional deprivation and often results in delayed mental development, poor school performance and reduced intellectual capacity
Wasting	Low weight for height It reflects acute undernutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases,

REFERENCES

1. Sustainable diets for healthy people and a healthy planet, UNSCN 2017. https://www.unscn.org/uploads/web/news/document/Climate-Nutrition-Paper-EN-WEB.pdf
2. National Nutrition Survey 2011. Ministry of Planning, Development and Reform/Ministry of National Health Services, Regulations & Coordination, Government of Pakistan.
3. Jesmin A, Yamamoto SS, Malik AA, Haque MA. Prevalence and determinants of chronic malnutrition among preschool children: A cross sectional study in Dhaka City, Bangladesh. J Health Popul Nutr 2011; 29 (5):494-499.
4. Jamison DT, Feachem RG, Makgoba MW, Bos ER, Baingana FK, Hofman KJ, Rogo KO. Disease and mortality in Sub-Saharan Africa. 2nd edition. Washington (DC): World Bank, 2006.
5. Tharakan CT, Suchindran CM. Determinants of child malnutrition-An intervention model for Botswana. Nutr Res 1999;19:843-860.
6. Khan AA., Bano N, Salma A. Child Malnutrition in South Asia: A comparative perspective. South Asian Survey 2007; 4:129-145.
7. World Bank. Repositioning nutrition as central to development: a strategy for large scale action: World Bank, Washington DC, 2006.
8. AICR. Cancer preventability estimates, Available at:http://www.aicr.org/research/research_science_policy_report.html?referrer=http://www.pcrm.org/health/cancer-resources. [Accessed 10 Nov, 2016].
9. Brouwer IA. Effects of transfatty acid intake on blood lipids and lipoproteins: a systematic review and meta-regression analysis. Geneva: World Health Organization; 2016.
10. Basit A, Fawwad A, Qureshi H, Shera AS; NDSP Members.Prevalence of diabetes, pre-diabetes and associated risk factors: second National Diabetes Survey of Pakistan (NDSP), 2016-2017. BMJ Open. 2018 Aug 5;8(8):e020961
11. Mensah GA , Brown DW. An overview of cardiovascular disease burden in the United States. Health Aff (Millwood). 2007 Jan-Feb;26(1):38-48
12. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, McQueen M, Budaj A, Pais P, Varigos J, Lisheng L. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364:937-52.
13. WHO. Non-communicable diseases country profiles. 2018. https://www.who.int/nmh/publications/ncd-profiles-2014/en/
14. UNICEF. Programming guide: Infant and young child feeding. Nutrition Section, United Nations Children's Fund, New York, 2011. https://www.unicef.org/nutrition/files/Final_IYCF_programming_guide_2011.pdf
15. UNICEF. Breastfeeding. Available at: https://www.unicef.org/nutrition/index_24824.html [Accessed 2 Feb, 2017].
16. WHO. Indicators for assessing infant and young child feeding practices: Part III country profile. World Health Organization, Geneva, 2010.
17. WHO. Infant and young child feeding. World Health Organization. 2018 Available at: https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding [Accessed 05 July, 2018].
18. WHO. Exclusive breastfeeding. Available at: http://www.who.int/nutrition/topics/exclusive_breastfeeding/en [Accessed 15 Nov, 2016].
19. WHO. Child growth standards. Department of Nutrition for Health and Development, World Health Organization 2006. Available at: http://www.who.int/childgrowth/standards/Technical_report.pdf. [Accessed 20 Nov, 2016].

20. Shrimpton, R., Victora, CG., de Onis, Lima, RC., Blossner, M., Clugston, G. Worldwide timing of growth faltering: Implications for nutritional interventions. Pediatrics. 2001 May;107(5):E75.
21. Khan, P.A., Qazi, S.A. and Rehman, G.N. Control of ARI in Pakistan. Presentstatuaanst future development, in ARI national programme for the control of acute respiratory infections in Pakistan. Edited by MA. Rhan, S.A. Oazi. R. Peerperkorn and A. Ban. Islamabad, Federal ARI Cell, MOH, GOP, 1990, p.32.
22. Saleemi, MA.,Zaman, S., Akhtar, HZ., Jalil, F., Ashraf, N., Hanson, LA., Mellander, L. Feeding patterns, diarrhoeal illnesses and linear growth in 0-24 month-old children. J Trop Paediatr 2004;50:164-169.
23. Musaiger, A.O.,D'Souza, R. Anthropometric characteristics of Pakistani school children living in Bahrain. J Immigrant Minority Health 2009; 11-205.
24. Mushtaq, M.U., Gull, S., Khurshid, U., Shahid, U., Shad, M.A., Siddiqui, A.M. Prevalence and socio-demographic correlates of stunting and thinness among Pakistani primary school children. BMC Public Health 2011;790-800.
25. Paracha, PI.,Bakht, S., Paracha, SI., Vriesekoop, F., Khattak, IA., Zia ud Din, NiamatUllah. Nutritional status, dietary practices and physical activities of adolescents in public and private schools of Karachi, Pakistan. Obes Res Open J. 2016; 3:30-39.
26. Aziz, S., Umme-e-Rubab, Noorulain, W., Majid, R., Hosain, K., Siddiqui, IA.,Manzoor, S. Dietary patterns, height, weight centile and BMI of affluent school children and adolescents from three major cities of Pakistan. J Coll Phys Surg Pak 2010;20:10-16.
27. WHO. Nutrition in adolescence: Issues in adolescent health and development, World Health Organization, Geneva, 2005
28. Spear, B.A. Adolescent growth and development. J Am Diet Assoc 2002;102(3):23-29.Aziz, S., Noor-ul-Ain, W., Majeed, R., Khan, MA.,Qayum, I., Ahmed, I., Hosain, K. Growth centile charts (anthropometric measurement) of Pakistani pediatric population. J Pak Med Assoc 2012; 62:367-377.
29. Hakeem, R., Sheikh, A.H., Asar, F. Assessment of linear growth of affluent urban Pakistani adolescents according to CDC 2000 references. http://www.informaworld.com/smpp/title~content=t713723502~db=all~tab=issues-list~branches=31 - v31Ann Hum Biol 2004; 31:282-291.
30. Paracha, PI.,Waheed, H., Paracha, SI., Shahidullah, Bano, SS. Cardiovascular diseases in relation to anthropometric, biochemical and dietary intake in women: A case control study. Obes Res Open J. 2015; 2:32-38.
31. Jafar, TH.,Jafary, FH., Jessani, S., Chaturvedi N.. Heart disease epidemic in Pakistan: Women and men at equal risk. Am Heart J 2005;150:221-226.
32. WHO. Salt reduction fact sheet. Available at: https://www.who.int/news-room/fact-sheets/detail/salt-reduction Accessed 31 July 2019].
33. World Bank. Pakistan GDP per capita. Available at: http://www.tradingeconomics.com/pakistan/gdp-per-capita.
34. Qidwai, W. Ageing Population: Status, challenges and opportunities for health care providers in Pakistan. J Coll Phys Surg 2009;19:399-400.
35. Alam I., Larbi A., Pawelec G., Paracha, PI. Relationship between anthropometric variables and nutrient intake in apparently healthy male elderly individuals: A study from Pakistan. Nutr J 2011;10-111-119.
36. Lowe, NM.,Ellahi, B., Bano, Q., Bangash, SA., Mitra, SR., Zaman, M. Dietary calcium intake, vitamin D status, and bone health in postmenopausal women in rural Pakistan. J Health Popul Nutr 2011;29:465-470.
37. Qureshi Z., Khan R. Diet intake trends among pregnant women in rural area of Rawalpindi, Pakistan. J Ayub Med Coll Abbottabad. 2015;27:684-88.

38. Henriksen C, Brunvand L, Stoltenberg C, Trygg K, Haug E, Pedersen JI. Diet and vitamin D status among pregnant Pakistani women in Oslo. Eur J ClinNutr 1995;49:211-218.
39. Shaikh F., Zeeshan F., Hakeem R., Basit A., Fawwad A., Hussain A. Maternal dietary intake and anthropometric measurements of newborn at birth. Open Diab J 2014; 7:14-19.
40. Ijlal, F. Iron deficiency anaemia in the females and children of the Northern areas of Pakistan. Ph.D. thesis submitted to Quaid-I-Azam University, Islamabad, 2005.
41. Zia ud Din.,Ambreen S., Iqbal Z., Iqbal M., Ahmad S., Hussain M. Emmett P. Inadequate dietary intake of women with antenatal psychological distress: A population based study in Pakistan. J Food Nutr Res 2014;2:1021-1028.
42. Lassi ZS.,Mansoor T., Salam RA., Das JK., Bhutta ZA. Essential pre-pregnancy and pregnancy interventions for improved maternal, newborn and child health. Reproductive Health 2014; 11: (Suppl I):S3.
43. Yakoob, MY.,Menezes, EV., Soomro, T., Haws, RA., Darmstadt, GL., Bhutta, ZA. Reducing stillbirths behavioural and nutritional interventions before and during pregnancy. BMC Pregnancy and Childbirth. 2009;9 (Suppl. 1):1-31.
44. IOM/NAP. Milk volume. Institute of Medicine, National Academy Press, Washington DC, 1991. Available at https://www.nap.edu/read/1577/chapter/6. [Accessed 15 Nov, 2016].
45. Heymann, J., Raub, A., Earle, A. Breast feeding policy: a globally comparative analysis. Bull WHO 2013;91:398-406.
46. Dewey, KG., Finley, DA., Lonnerdal, B. Breast milk volume and composition during late lactation (7-20 months). J. Pediatr Gastroenterol Nutr 1984; 3:713-720.
47. Allen, LH. B vitamins in breast milk: Relative importance of maternal status and intake, and effects on infant status and function. Adv Nutr 2012;3:362-369.
48. MPDR/GOP. Annual plan 2016, Ministry of Planning Development and Reform, Government of Pakistan.
49. FAO. Food balance sheets. Available at http://www.fao.org/faostat/en/#data/FBS. [Accessed 16 Nov, 2016].
50. MF/GOP. Chapter 11: Health and Nutrition, Pakistan Economic Survey, 2015-16. Ministry of Finance, Government of Pakistan, Islamabad. Available at: http://www.finance.gov.pk/survey/chapters_16/11_Health.pdf. [Accessed 5 Nov, 2016].
51. Word Bank. Pakistan GDP per capita PPP.
52. MF/GOP. Chapter 16:0 Poverty, Pakistan Economic Survey, 2015-16. Ministry of Finance, Government of Pakistan, Islamabad. Available at: http://www.finance.gov.pk/survey/chapters_16/Annexure_III_Poverty.pdf.[Accessed 5 Nov, 2016].
53. Malik, SJ.,Nazli. H., Whitney, E. IPFRI PSSP. Food consumption patterns and implications for poverty reduction in Pakistan, 2015. The Pakistan Development Review, 54:4, Part II, 651-670.
54. Asia and Pacific Commission on Agricultural Statistics. Revision of the methodology for the estimation of the Prevalence of Undernourishment http://www.fao.org/fileadmin/templates/ess/documents/apcas25/APCAS-14-8.2-PoU-Method.
55. FAO/IFAD/WFP. The state of food insecurity in the world 2018. Available at http://www.fao.org/3/i9553en/i9553en.pdf [Accessed 12 March, 2019].
56. FAO. The state of food insecurity in the world 2018.
57. WHO. Diet, nutrition and prevention of chronic diseases. Technical Report Series No. 916, World Health Organization, Geneva, 2003.
58. WHO. Policy statement and recommended actions to lower national salt intakes and lower death rates from high blood pressure and strokes in East Mediterranean Regions. World Health Organization, 2014.
59. WHO. Cancer prevention. World Health Organization, Geneva Available at: http://www.who.int/cancer/prevention/en/. [Accessed 4 Nov, 2016].

60. Malik, SJ. Food consumption patterns and nutrition. Available at:http://www.slideshare.net/IFPRIDSG/s5-dr-sohail-j-malik-food-consumption-and-nutrition, 2015 [Accessed 15 Sep, 2016].
61. Ministry of Finance/Government of Pakistan. Economic Survey of Pakistan 2017-18.
62. WHO. Nutrient requirements and dietary guidelines. World Health Organization, Geneva. Available at http://www.who.int/nutrition/publications/nutrient/en/. [Accessed 16 Nov, 2016].
63. Summary report of the EAT- Lancet Commission on Food, Planet and Health. Available at: https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/.[Accesed 2 April 2019]
64. Akhtar M. Fast food industry of Pakistan growth and history. Available at: http://ilm.com.pk/pakistan/pakistan-information/fast-food-industry-of-pakistan-growth-and-history/. [Accessed 2 Nov, 2016].
65. American Diabetes Association. Glycemic index and diabetes.2014. Available at: http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/glycemic-index-and-diabetes.html [Accessed 15 Dec, 2016].
66. Oh, K , Hu, FB., Cho, E., Rexrode, KM., Stampfer, MJ., Manson, J E., Liu, S., Willet, WC. Carbohydrate intake, glycemic index, glycemic load and dietary fiber in relation to risk of stroke in women. Am J Epidemiol 16:161-169;2005.
67. Greenwood, DC.,Threapleton, DE., Evans., CE. Glycemic index, glycemic load, carbohydrates, and type 2 diabetes: systematic review and dose-response meta-analysis of prospective studies. Diabetes Care. 2013; 36:4166-4171.63.
68. American College of Allergy, Asthma & Immunology. Food allergy. 2014. Available at (http://acaai.org/allergies/types/food-allergy) [Accessed 6 Jan 2017].
69. Asthma and Allergy Foundation of America. What is food allergy? Available at: http://www.kidswithfoodallergies.org/page/what-is-a-food-allergy.aspx. [Accessed 15 Dec, 2016].
70. Moazzam I. Processed food: Good or bad?http://tribune.com.pk/story/671287/processed-food-good-or-bad/. *The Express Tribune, February 16th, 2014.* [Accessed 15Dec, 2016].
71. BMI Classification. Available at: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html [Accessed 13 Dec, 2016].
72. WHO.Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation. World Health Organization, Geneva Available at: http://apps.who.int/iris/bitstream/10665/44583/1/9789241501491_eng.pdf. [Accessed 12 Dec, 2016].
73. WHO. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. World Health Organization, Geneva. Available at : https://www.who.int/nutrition/publications/bmi_asia_strategies.pdf
74. Imayama, I., Ulrich, CM., Alfano, CM., Wang, C., Xiao, L., Wener, MH. Effects of caloric restriction weight loss diet and exercise on inflammatory biomarkers in overweight/obese postmenopausal women: a randomized controlled trial. Cancer Res 2012;79: 2314-2326.
75. WHO. Global recommendations on physical activity for health. World Health Organization, Geneva. Available at: http://www.who.int/dietphysicalactivity/publications/9789241599979/en/. [Accessed 15 Nov, 2016].
76. Donnelly, JE., Blair, SN., Jakicic, JM., Manore, MM., Rankin, JW., Smith, B. K. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. Med and Science in Sports and Exercise, 2009;41: 459-471.
77. Dart, H., Nguyen, N., Colditz, G. A. Physical activity and chronic disease prevention: The young female athlete (pp. 163-179), Contemporary Pediatric and Adolescent Sports Medicine book series (PASM). Springer, 2016.
78. WHO. Physical inactivity a leading cause of disease and disability, warns WHO. World Health Organization, Geneva. Available at: http://www.who.int/mediacentre/news/releases/release23/en/ [Accessed 15May, 2017].

79. Gilani Foundation. A 30 years of polling on eating habits of Pakistanis (1980-2010). Available at: http://www.gilanifoundation.com/homepage/30years/30YearsOfPollingOnEatingHabitsOfPakistanis.pdf [Accessed 15 May, 2017].
80. Stang, J., Story, M., Kossover, R. Promoting healthy eating and physical activity. Available at: http://www.epi.umn.edu/let/pubs/img/adol_ch6.pdf. [Accessed 20 Sep, 2016].
81. WHF. Totally avoidable risk factor for CVD. Available at:http://www.world-heart-federation.org/fileadmin/user_upload/documents/Fact_sheets/2012/Tobacco_avoidable_risk_factor_of_CVD.pdf. [Accessed 20 Nov, 2016].
82. WHO/MoH/Heartfile. National action plan for prevention and control of non-communicable diseases and health promotion in Pakistan, Islamabad, World Health Organization, Ministry of Health, Govt. of Pakistan and Heartfile, 2004.
83. WHO. Tobacco. World Health Organization, Geneva . Available at: http://www.who.int/mediacentre/factsheets/fs339/en/. [Accessed 5 Nov, 2016].
84. GOP. Pakistan Demographic and Health Survey (2012-013). National Institute of Population Studies, Government of Pakistan, Islamabad, Pakistan, 2013. Available at http://www.nips.org.pk/abstract_files/PDHS%20Final%20Report%20as%20of%20Jan%2022-2014.pdf. [Accessed 10 Nov, 2016].
85. Nikodemowicz M. The effects of smoking on cardiovascular system. Przegl Lek. 2007;64 Suppl 4:42-4.
86. WHO. Food safety. World Health Organization, Geneva. Available at: http://www.who.int/mediacentre/factsheets/fs399/en/, 2015. [Accessed 5Nov, 2016].
87. WHO. Water for health. World Health Organization, Geneva. Available at: http://www.who.int/water_sanitation_health/takingcharge.html. [Accessed 5 Nov, 2016].
88. WHO. International standards for drinking water. World Health Organization, Geneva. Available at: http://apps.who.int/iris/bitstream/10665/43845/1/a91160.pdf. [Accessed 4Jan, 2017].
89. Nectar water Technologies. UNICEF. Available at: http://nectar.com.pk/2016/09/10/unicef/. [Accessed 5 Nov, 2016].
90. Clean Drinking water for all (CDWA)project. Available at: http://www.environment.gov.pk/PRO_PDF/CDWA-Briefs.pdf. [Accessed 5 Nov, 2016].
91. Memon AN. Nutritional problems in Pakistan. Available at: https://www.nuas.ac.jp/IHN/report/pdf/01/07.pdf. [Accessed 5 Nov, 2016].
92. WHO. Guidelines for drinking water quality. Available at: http://www.who.int/water_sanitation_health/dwq/fulltext.pdf[Accessed 13 Jan, 2017].
93. WHO/FAO. Preparation and use of food based dietary guidelines. Technical Report Series No. 880, World Health Organization, Geneva.
94. Dahl WJ, Stewart, ML. Position of the academy of Nutrition and Dietetics: Health implications of dietary fibre. J Acad Nutr Diet 2015; 115(11):1861-70.
95. Food Composition Table of Pakistan (Revised 2001), Department of Agricultural Chemistry, University of Agriculture, Peshawar.
96. FNB/NRC/IOM/.Dietary reference Intake Food and Nutrition Board/National Research Council, Institute of Medicine, Washington, DC
97. FAO. Human energy requirements: Report of a joint FAO/WHO/UNU Expert Consultation. Food and Agriculture Organization, Rome, 2004.
98. NIN/ICMR. Nutrient requirements and recommended dietary allowances for Indians. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, 2011.

99. WHO. Complementary feeding. World Health Organization, Geneva. Available at:http://www.who.int/nutrition/topics/complementary_feeding/en/. [Accessed 15 May, 2017].

100. WHO. Complementary feeding: Report of the global consultation. World Health Organization, Geneva . Available at http://www.who.int/nutrition/publications/Complementary_Feeding.pdf [Accessed 15 May, 2017].

101. MNHSCR/Unicef. Pakistan Infant and Young Child Feeding Strategy, 2016-20. Ministry of National Health Services Regulations & Coordination, Government of Pakistan, 2015.

102. Baker R. et al. Toddler Nutrition. Available at:https://www.meadjohnson.com/pediatrics/us-en/sites/hcp-usa/files/LB2264.pdf [Accessed 15 May, 2017].

103. USDA/USDoHHS . Dietary guidelines for Americans 2010. Available at:https://health.gov/dietaryguidelines/dga2010/dietaryguidelines2010.pdf[Accessed 15 May, 2017].

104. Growth reference data for 5-19 years. Available at: http://www.who.int/growthref/en/. [Accessed 5 Nov, 2016].

105. Dimeglio G. Nutrition in adolescence. Available at:https://pedsinreview.aappublications.org/content/21/1/32 [Accessed 10 April, 2019].

106. IOM/NAP. Nutrition during pregnancy: part I Weight gain: Part II Nutrient supplements. Available at: http:// www.ncbi.nlm.nih.gov/books/NBK235235/[Accessed 22 Oct, 2016]. Institute of Medicine, National Academy Press, Washington D.C. 1990.

107. IOM/ FNB. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients). A Report of the Panel on Macronutrients, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Institute of Medicine, Washington, DC, 2005. Available at http://www.nap.edu/catalog/10490.html.

108. Health Canada. Eating well with Canada Food's Guide: A resource for educators and communicators. Available at: http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/pubs/res-educat-eng.pdf [Accessed 15 Dec, 2016].

109. WHO. Infant and young child feeding. World Health Organization, Genera. Available at: https://www.who.int/en/news-room/fact-sheets/detail/infant-and-young-child-feeding

110. WHO. Healthy diet fact sheet no. 394. Available at: http://www.who.int/elena/healthy_diet_fact_sheet_394.pdf [Accessed 5 Nov, 2016].

111. Venkaiah, K., Damayanti, K.,Nayak, MU., Vijayaraghavan, K. Diet and nutritional status of rural adolescents in India. Eur J ClinNutr 2002;56:1119-1125.

112. Konje, JC.,Ladipo, OA. Nutrition and obstructed labor. American Journal of Clinical Nutrition 2000;72:291S-297S

113. Understanding Nutrition. 2011. Ellie Whitney & Sharon Rady Rolfes, 12th Ed.: Wadsworth Cengage Learning, USA

114. Aziz, S., Noor-ul-Ain, W., Majeed, R., Khan, MA.,Qayum, I., Ahmed, I., Hosain, K. Growth centile charts (anthropometric measurement) of Pakistani pediatric population. J Pak Med Assoc 2012; 62:367-377.

115. Williams' basic nutrition and diet therapy, 14th Edition.

NUTRITION
at the heart
of the SDGs
Every $1 invested
gives $16 return
$1
$16
Nutrition is a vital precondition for achieving these goals
Achieving these goals supports nutrition
Good nutrition increases earning capacity
Good nutrition supports productive lives
Good nutrition makes for good health
Good nutrition drives up IQ levels
Good nutrition supports women's development
50% of malnutrition is linked to poor sanitation
Essential for producing food and thus nutrition
0.9% of GDP is lost to iron deficiency alone
Essential for innovations to improve nutrition
Partnership is key to improving nutrition
Ending malnutrition supports stable societies
Sustainable food production can improve nutrition
Healthy dietary choices can be good for the planet
Seasonal effects influence nutritional status
Reliable food supply helps stabilize food prices
Malnutrition is widespread in slums / shanty towns
Almost 50% of countries experience malnutrition
1
2 ZERO HUNGER
3
4
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8
9
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16
17 PARTNERSHIPS FOR THE GOALS

Healthy People Strong Nation

Build healthy eating patterns

Drink plenty of water

Perform regular physical exercise

Adopt healthy life style and reduce stress

Limit Consumption of Unhealthy Foods

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